

CHEMICAL ABSTRACTS

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I—APPARATUS

C. G. DERRICK

A modification of Lunge's nitrometer. FR. BLECHTA. *Chem. Listy* 14, 43-5 (1920).—The calibrated tube of the Lunge nitrometer is provided with a short side tube equipped with a tight-fitting stopper. The app. is designed for use in analyzing substances difficultly sol. in H_2SO_4 .

JOHN M. KANO

Meker burners and Meker furnaces (gas) for industrial purposes. STAVORINSKY. *Hot Gas* 40, 214-8 (1920).—A discussion of the use in the industries, chiefly metallurgical, of Meker burners and furnaces.

NATHAN VAN PATTEN

A simple shaking device. J. P. BAUMBERGER. Stanford Univ. *J. Lab. Clin. Med.* 6, 222 (1921).—The driving rod of a color-mixing bench is attached to a crank shaft, which is turned by a motor-driven pulley wheel. A forward, upward, backward and downward motion is given.

E. R. LONG

Titration bench. W. A. VAN WINKLE. *J. Ind. Eng. Chem.* 13, 146 (1921).—The bench, particularly adapted for evening work, consists essentially of a glass base with under side painted white, triangular ground-glass sides, rectangular back, and special ground-glass screen to protect eyes of the operator, all set up in wooden housing. Directly back of the bench is placed a portable lighting compartment containing two 100-watt N-filled daylight lamps. This compartment is constructed principally of asbestos board and all wooden parts are painted a dull white.

C. C. HERITAGE

Methods of examination of lubricating oils. G. F. ROBERTSHAW. *J. Ind. Petroleum Tech.* 6, 324-78 (1920); cf. *C. A.* 14, 2078, 2547.—A detail-drawing and description of the Michell viscosimeter are included.

W. F. FARAGHER

Potentiometer indicator for wall mounting. ANON. *Elec. Rev.* 78, 235 (1921).—An indicator consisting of a cast-metal box which is practically dustproof, easily cleanable, free from delicate mechanism, and is standardized by a self-contained standard cell. With the long range, 93-982°, a change of 2.3° is easily detected; and with the short range, -17.7-149°, a change of 0.55° is detected. Adjustment and operation are outlined.

W. H. BOYNTON

Small portable photometer. DAVIS TUCK. *Elec. World* 77, 476 (1921).—The overall length is 30 cm., the max. diam. 5.4 cm. and the wt. complete with the battery 0.7 kg. The scientific principle involved is that of the Sharp-Miller and the Macbeth instruments. The arameter is of the D'Arsenval type. Three scales are provided, showing candlepower, millilamberts and foot candles, resp. The photometric device is a modified Lummer-Brodhun cube. The range of the foot-candle scale is from 0.1 foot candle to 15 foot candles.

C. G. T.

Simple electrical heating apparatus for evaporation of liquids. EDUARD MOSER. *Z. anorg. Chem.* 33, I, 300 (1920).—A fire-clay dish 20 cm. in diam. and 5 cm. deep is provided with 2 sheet iron electrodes, 12 cm. wide, placed opposite each other. Lead wires are attached to screw clamps which hold the electrodes in place. A mixt. of 120 g. granular C and 80 g. ground fire clay is spread between the electrodes, giving satisfactory heating with a 220-v. circuit. Six amp. fuses are used.

C. C. H.

Laboratory applications of the triode valve (SCOTT-TAGGART) 4.

EALAND, C. A.: *The Romance of the Microscope*. London: Seeley, Service, and Co., Ltd. 314 pp. 7s. 6d. For review see *Nature* 106, 627(1921).

Gas-analysis apparatus. C. W. HEATH. U. S. 1,366,382, Jan. 25. The pat. relates especially to the construction of jackets and connections for supplying cooling liquid for equalizing the temp. of the first and second measuring vessels, between which the absorption vessel is placed.

Calorimeters. IGRANIC ELECTRIC CO. Brit. 153,817, Feb. 4, 1920. In a gas calorimeter in which the gas and a stream of air, the rise of temp. of which is measured, are supplied in constant volumetric proportions, the gas and air are initially subjected to like temp., pressure, and satn. conditions. A suitable app. is specified.

Water-still. C. E. KELLS. U. S. 1,366,465, Jan. 25. The app. is especially adapted for distg. relatively small quantities of H₂O as required by physicians or dentists, with a minimum amt. of attention. The app. can be constructed of glass and comprises a still, condenser, receiving flask and a constant-level H₂O-supply connected to the still. The constant-level reservoir supplying H₂O to the still is mounted on one end of a balanced platform, the other end of which is connected to a cock controlling the gas-supply leading to a burner under the still. The receiving flask is similarly mounted, so that in case either of failure of the H₂O-supply or undue accumulation of H₂O from the condenser in the receiving flask the supply of gas to the burner is automatically cut off and the distn. stopped.

Filters for water or other liquids. J. P. PROBST. U. S. 1,367,324-5, Feb. 1.

Filter for gasoline or other liquids. H. L. KRUMWIEDE. U. S. 1,367,783, Feb. 8.

Apparatus for pasteurizing beer or other liquids. A. HOSTETTLER. U. S. 1,367,517, Feb. 1.

Apparatus for treating liquids with ultra-violet rays. J. C. POLE. U. S. 1,367,090, Feb. 1. The app. is adapted for sterilizing liquids.

Crystallizing-receptacle. F. MERZ. U. S. 1,366,474, Jan. 25. A receptacle adapted for the crystn. of various substances is formed of flexible and impermeable material such as caoutchouc so mounted upon supports that its walls may be subjected to deformation in order to effect detachment of crystals.

Drying-cylinders. J. MCINTYRE and J. MILNE & SON. Brit. 154,508, Apr. 12, 1920. Cylinders for drying food, paper, and the like have their ends or the plates covering their ends enamelled with glass, vitreous, stove, or like enamel, to prevent dirt, etc., from adhering to the ends of the cylinders.

2—GENERAL AND PHYSICAL CHEMISTRY

W. E. HENDERSON

Phlogiston. OT. ZACHAR. *Chem. Listy* 14, 97-8, 112-4, 126, 146-9, 172-4(1920).

—Historical.

JOHN M. KRNO

The word "gas." L. J. TERNESEN. *Het Gas* 40, 199-200(1920).—Historical.

NATHAN VAN PATTEN

Otto Unverdorben, the discoverer of aniline. HERMANN SCHELENZ. *Z. angew. Chem.* 34, 1, 31-2(1921).

E. H.

Martin Heinrich Klaproth, a German chemist of the eighteenth century. RICHARD MEYER. *Z. angew. Chem.* 34, 1, 1-3(1921).

E. H.

Franz Richarz. F. A. SCHULZE. *Physik. Z.* 22, 38-6(1921).—An obituary.

E. J. C.

Present and future position of the chemical societies of Great Britain. H. DROOP RICHMOND. *J. Soc. Chem. Ind.* 40, 4-6R(1921).

E. J. C.

Research. EDGAR FAHS SMITH. *J. Ind. Eng. Chem.* 13, 254-5(1921).—A report of an address. Personal experience is recited. The researcher should be broadly trained—a chemist before he is an org. chemist or other special kind—and a diligent worker, gleaning from all fields.

E. J. C.

The organization of research. WILLIAM M. WHEELER. *Science* 53, 53-57(1921).—It is "important to preserve from organization that sphere in which it adds least to, and is apt to detract most from, our field of self-expression."

E. J. C.

The present movement for the reorganization of scientific research in France. R. FAURÉ-FRÉMIET. *Rev. sci.* 59, 1-10(1921).

E. J. C.

The development of the definition for the concept "element" in modern chemistry. BARBOROVSKY. *Chem. Listy* 14, 47-50(1920).—An historical address. J. M. K.

Surface energy, latent heat and compressibility. D. L. HAMMICK. Oxford. *Phil. Mag.* 41, 21-33(1921); cf. *C. A.* 14, 682.—Using the data of various authorities, H. tests new formulas which he deduces relating surface energy, latent heat and compressibility. If the van der Waals const. a is independent of vol. the compressibility (β) of a liquid should be connected with the internal heat by the relation: $(1/\beta).(1/J) = -2\lambda_1 s$, in which λ_1 is the internal latent heat, s is the sp. gr. of the liquid, J is the mechanical equiv. of heat. But if a is a function of the vol., $(1/\beta).(1/J) = \epsilon \lambda_1 s$, where $\epsilon = \rho/\alpha$ in which ρ is the coeff. of variation of surface energy with temp. and α is the cubical coeff. of expansion. For the limited number of liquids for which data are available, the former relation is approached at higher temps. (the relation holding as such for some liquids at their b. ps.), while the latter expression becomes progressively more nearly applicable with reduction of temp. W. C. M. Lewis's (*C. A.* 5, 3362; 5, 171) empirical approximation that heat of compression is equal to heat of vaporization per unit vol. at 0° is deduced. The approximate const. of the product compressibility \times surface energy at 0° is deduced and the observed lack of constancy at other temps. is accounted for.

S. C. LIND

Comments on the work of Bragg and the law of definite proportions. A. QUARTAROLI. R. ist. tecnico, Pisa. *Gazz. chim. ital.* 50, II, 60-4(1920).—The various hypotheses for explaining the continuous changes in colloids agree that the compn. of the granule in the superficial zone differs from that of the internal nucleus. They differ as to the cause of this condition. According to Weimarn's theory the colloidal granules (ultramicrocrystals) tend slowly to increase in size until they become ordinary crystals of definite compn. This fundamental conception when put into relation with the results of Bragg on the constitution of crystals gives a simple natural interpretation of the difference in the 2 zones of a colloid. The structure of crystals is shown not to require the ordinary conception of mols. In this view pyrite may be represented as built up of elementary cubes having a S atom at the center and 4 Fe atoms at alternate vertices. With respect to 1 cube the compn. is Fe_4S while pyrite is FeS_2 . But Q. shows that for n cubes the formula would be $\text{Fe}_{(n+1)}\text{S}_{2n}$. If n is 50 the formula is $\text{Fe}_{51}\text{S}_{100}$ and the limit is FeS_2 . Assuming that the cubes have a diam. of 10^{-3} cm. it would require a cube built of 50 cubes in diam. to give a solid with a diagonal 8.655 μ , which is within the range of visibility with the ultramicroscope. A tetrahedron built in this way would have 41,700 cubes and 46,850 vertices and its compn. would be $\text{Fe}_{51.75}\text{S}_{100}$. This it appears requires and explains the variation in the compn. of such colloids obtained by coagulation. As shown pyrite could vary in compn. from Fe_4S to FeS_2 . Magnetite, haussmannite, spinel, etc., with R_2O_3 may be similarly interpreted with cubes with 4 metallic atoms on the 4 upper vertices, 2 metallic atoms diametrically opposite on 2 lower vertices and an atom of O in the center of the cube. R_2O_3 may only be built up of hexagonal prisms, and typical oxides of this kind (Fe_2O_3 and Al_2O_3) crystallize in the hexagonal system.

E. J. WITZEMANN

Osmotic pressure, regarded as a capillary phenomenon. H. HULSHOF. *Proc. Acad. Sci. Amsterdam* 23, 184-92(1920).—An attempt is made by mathematical means to explain osmotic pressure as a consequence of capillary actions, supposing that at a point of the passage layer, fluid-vapor or fluid-wall, the influence of the attraction in different directions has different values. The expression $dp_2 = \epsilon dp - \rho dh$ is derived for several cases, where p_2 is defined as the total force for a surface element perpendicular to the passage layer exerted by the part of the system on one side of a plane on the part on the other side, ϵ the energy at the height h measured upward perpendicular to the passage layer, and $\rho = 1/v$. It is shown that p_2 will change at the solid wall when the concn. of a soln. is altered. Thus if 2 vessels containing dil. sugar soln. were connected by a tube part of which was so narrow that no sugar mols. could pass, this part would contain only the outer layer of the passage layer, and p_2 would be the same throughout. If the concn. in one vessel were increased by the amt. Δx , then as far as the narrow tube the pressure along the wall would diminish by Δp_2 , equil. would be destroyed, the pressure in the tube would fall, and pure H_2O would stream in from the other vessel. If the second vessel contained no sugar and there were an osmotic pressure in the first corresponding to the concn. x , then the decrease of the pressure along the wall caused by the increase in concn. dx would be equal to the increase of the osmotic pressure due to capillary action. From the equation $v \Delta p_2 = -MRT \Delta x_1 = \Delta \mu M$, where μ is the thermo-dynamic potential, are derived expressions identical with those derived from the theory of capillarity. Both from these considerations and from the lowering of the m. p. there are indications that the concn. of a soln. can be zero at a solid wall.

G. L. CLARK

Density and specific rotation of liquid mixtures with an optically active component. W. DEUTSCHMANN. Charlottenburg. *Z. physik. Chem.* 96, 428-36(1920).—Equations have been developed for calcg. the vol. and the rotation of liquid mixts. as well as the change in these quantities. When an inactive, non-associated substance, B , is mixed with an active substance, A , the change in vol. is $\Delta v = (v_{a2}^0 - v_{a2})(2v_{a1} - v_{a2})$, and the change in rotation is $\Delta \Phi = (x_{a2}^0 - x_{a2})(2\phi_{a1} - \phi_{a2})$, whence $\Delta v / \Delta \Phi = (2v_{a1} - v_{a2}) / (2\phi_{a1} - \phi_{a2}) = \text{const.}$, where x_{a2}^0 is the number of double mols. of A before mixing, x_{a2} the number of double mols. of A after mixing, v_{a1} is the mol. vol. of the simple A mols., v_{a2} is the mol. vol. of the double mols. of A , and ϕ_{a1} and ϕ_{a2} stand for the mol. rotation of the simple and double A mols., resp. This equation has been applied to mixts. of oil of terpentine (A) and C_8H_8 (B) containing varying concns. of these components, and fairly const. values have been obtained for the ratio. Values calcd. for Δv , $\Delta \alpha$ ($= \Delta \Phi / \text{mol. wt.}$) and α by means of the foregoing and additional equations agree very closely with observed values.

H. JERMAIN CREIGHTON

Effect of absorbed gases on the surface tension of water. SHANTI SWARUPA BHATNAGAR. *J. Phys. Chem.* 24, 716-35(1920).—The surface tension of water at 15° in a vacuum and in various gases was detd. with the following results: vacuum, 71.3 (dynes); H , 72.83; N , 73; CO , 73; CO_2 , 72.85; air, 73.1. Thus the tension increases in the same order as the ds. of the gases, except in CO_2 , whose soly. in H_2O may be connected with this effect. Stockle and Meyer found a similar effect of CO_2 on the surface tension of Hg (Freundlich, *Kapillarchemie*, p. 86(1909)). The measurements were made by the sphere segment method of Ferguson (*C. A.* 8, 2288). A slight modification in the optical method of detg. the radius of curvature of curved surfaces by making use of single-filament lamps and traveling microscopes to secure greater accuracy is described.

C. C. VAN VOORHIS

Orientation of molecules in surfaces. VI. Cohesion, adhesion, tensile strength, tensile energy, negative surface energy, interfacial tension, and molecular attraction. WM. D. HARKINS AND Y. C. CHENG. Univ. Chicago. *J. Am. Chem. Soc.* 43, 35-53 (1921).—The paper gives the first accurate data from which the total interfacial energy

can be calcd., and discusses the work of adhesion and of surface cohesion, the interfacial tension and free surface energy, the tensile work, the energy of adhesion, of cohesion, and of surface cohesion, the tensile energy, the internal pressure or cohesion, and the related mol. attraction, these relations being illustrated by exptl. data obtained for 12 organic liquids. The data indicate that the surfaces or interfaces between H_2O and heptine (with a triple bond at the end of the chain), or secondary octyl alc., or heptaldehyde, exhibit, in contradistinction to what has been hitherto observed, a *negative surface tension*. Further, indication has been obtained that the formation of certain surfaces is accompanied by a rise in temp. A number of changes in tensile energy and in adhesional energy which accompany changes in constitution, and the fact that the very symmetrical halogen derivs., CCl_4 and $C_2H_5Br_2$, which give especially high values for their own tensile energy, give especially low values for their adhesional energy towards H_2O , are easily explained on the basis of the hypothesis that the unsymmetrical mols. are orientated in the surface. This is strong evidence in favor of the orientation hypothesis. It is shown that the adhesional energy towards H_2O is detd. by the strongest electromagnetic fields in the mol., while the tensile energy is detd. by the weakest fields, provided the mols. are unsymmetrical. Nearly the same values have been obtained for the solubilities of heptylic acid, heptine and heptaldehyde, indicating that the length of the chain is the important factor in detg. the soly. The triple bond at the end of the heptine mol. has been found to increase the adhesional work from about 42 to 67, and the total adhesional energy from 105 to 147, the lower values being those of the corresponding satd. compds. In conclusion, the relative influence of the triple bond on the adhesional energy and on the adhesional work is discussed.

H. JERMAIN CREIGHTON

Gallium, its electrolytic behavior, purification, melting point, density, coefficient of expansion, compressibility, surface tension and latent heat of fusion. THEODORE W. RICHARDS and SYLVESTER BOYER. Harvard Univ. *J. Am. Chem. Soc.* **43**, 274-94 (1921).—While the max. value of the single electrode potential of Ga (-0.30 v. in 0.1 N soln., if the calomel electrode potential is taken as $+0.56$ v.) apparently places it between In and Zn, Ga is distinctly more difficult to ppt. electrolytically than Zn. This apparent inconsistency may be due to Ga having a mild degree of passivity. The following values of phys. properties of Ga have been measured: m. p. = 29.75° on the international H scale; at the m. p., d. (solid) = 5.904 and d. (liquid) = 6.095 ; the cubic coeff. of expansion = about 0.000055 ; the compressibility of the solid = 0.0000020 and that of the liquid about twice as much; the surface tension of the liquid element in CO_2 at 30° = 36.54 mg./mm.; the latent heat of fusion = 19.04 cal./g. at 173 megabars pressure, *i. e.*, the m. p. is lowered 0.00207° for an increase of pressure of 1 atm.

H. JERMAIN CREIGHTON

The properties of plastic crystals of ammonium nitrate. W. N. BOND. *Phil. Mag.* **41**, 1-21 (1921).— NH_4NO_3 freshly crystd. from aq. soln. at ordinary temp. usually forms long needles, but sometimes flat tabular crystals instead. The needle-like crystals can be bent or twisted in the fingers, provided the force is not applied too suddenly. Photographs and diagrams are given illustrating the formation of bows, twists, semi-circles, and complete rings. On applying a load to a crystal, supported horizontally the initial rate of bending is greatest; the rate of bending increases much more rapidly than in direct proportion to the stress. A calcn. of pseudo-viscosity gave results of the same magnitude as those for glacier ice. The results cannot be accounted for merely by "slip." Viewed between crossed Nicol prisms the extinction lines of the bent crystal were not normal to the curvature but inclined at an angle of 45° in either direction. The structure as disclosed by optical properties is but little changed by bending. The probable internal changes in cryst. structure attending bending are discussed.

S. C. LIND

The theory of the equation of states. L. MARIO BASTO WAGNER. Lisbon. *Z. physik. Chem.* 96, 483-97(1920); cf. *C. A.* 9, 741.—This is a mathematical paper in which a number of equations are derived from van der Waals' hypothesis. These equations, as W. points out, are of so complex a structure that they are practically unusable. It is further pointed out that there is little possibility of obtaining an equation of state that is characterized by both simplicity and rigidity of derivation.

H. JERMAIN CREIGHTON

Physics and chemistry of colloids and their bearing on industrial questions. Physical properties of elastic gels. E. HATSCHEK. *Chem. News* 121, 241-3; *Chem. Age (London)* 3, 470-2(1920).—Table jellies (gelatin gel) exhibit the characteristics of elastic gels, i. e., stability of shape and perfect elasticity within certain limits. Gels may be made by cooling the sol, or by swelling the substance. Some swell and become dispersed in the cold solvent, e. g., gum arabic; some swell in the cold but dissolve only when heated, e. g., gelatin; while others swell in the solvent but do not dissolve even at the b. p., e. g., vulcanized rubber in benzene. The modulus of elasticity varies from 2.42 (g./mm.²) to 29.4 as the concn. increases from 10 to 45%. It does not reach its true value until about 24 hrs. after the formation of the gel. Chlorides lower the modulus, Na₂SO₄ has no effect, while cane sugar and glycerol raise it. Strain causes double refraction, which, at temps. considerably below the m. p., does not entirely disappear for days, and which is roughly proportional to the concn. The index of refraction is also proportional to the concn. and does not change suddenly at the m. p. of the gel. The diffusion of salts in gels does not differ from that in pure water until the concn. of the gel is greater than about 4%. The diffusion is reduced somewhat by certain nonelectrolytes, such as dextrose, glycerol and alc. The two fundamental problems of gels are structure and swelling. One school holds that the structure is homogeneous, while the other favors some sort of heterogeneity, e. g., cell, or network structure.

E. B. SPEAR

Structure of gels. J. G. W. BARRATT. *Chem. Age (London)* 3, 473(1920).—It has been shown that certain gels, which do not exhibit fibril formation at first, may be made to do so with the lapse of time. Gels with numerous amicroscopic fibrils will appear dry and rigid rather than elastic, while those in which the fibrils are coarse will exhibit syneresis. The fibril hypothesis explains gel filtration and the phenomena of diffusion through gels.

E. B. SPEAR

Reversible sol-gel transformation. S. C. BREDFORD. *Chem. Age (London)* 3, 472-3(1920).—B. suggests that sols, especially suspensoids, resemble supersatd. solns. of crystalloids. Gelation is a process closely allied to crystn. Many sols will gel more quickly if seeded with particles of gel. From some sols either a gel or crystals may be obtained at will. The greater elasticity of the skin of gels as compared to that of the interior is probably due to the better felting and cementing of the particles. The somewhat looser union in the interior may be the result of insufficient concn.

E. B. SPEAR

Coagulation of gold hydrosols by electrolytes. Change in color, influence of temperature and reproducibility of the hydrosol. J. N. MUKHERJEE AND B. C. PAPANICOLAOU. *J. Chem. Soc.* 117, 1563-73(1920).—A spectrophotometric study was made of the changes of color during the coagulation of gold hydrosols prepd. by Zsigmondy's nucleus method. The change in the absorption coeff. is greatest at the red end of the spectrum. In the region where the wave length is about 506 μ a limiting value is reached which is independent of the size of the particles and also of the nature of the electrolyte added. The change in the red end may be advantageously employed to det. the rate of coagulation. When the temp. is raised the rate is greater for the case of Ba and Sr salts, but is unaffected for K salts. It was found that Au

sols prepd. with greatest care by the same method gave perceptible differences in the time of coagulation although the Au numbers were identical.

E. B. SPEAR

Coagulation of colloidal solutions by electrolytes. Influence of the concentration of the sol. E. F. BURTON AND MISS E. BISHOP. Univ. Toronto. *J. Phys. Chem.* **24**, 701-15(1920).—The results of exptl. work recorded in this article throw light on the controversy over the Schultze-Linder-Picton pptn. law. When mastic and As_2S_3 colloidal solns. at different concns. were treated with K, Ca and Al salts it was found that in order to produce coagulation in a given time the necessary concn. of K^+ became greater, that of Ca^{++} remained approx. the same and the concn. of Al^{+++} became less as the diln. of the colloid was increased. Similar conditions were found to hold for the positively charged colloidal copper, where Cl^- , SO_4^{--} and PO_4^{--} ions were employed as pptg. agents. As the diln. of the colloid was increased it was necessary to add more Cl^- , the same amt. of SO_4^{--} and less of PO_4^{--} per unit vol. in order to coagulate the colloid. The authors suggest there are several factors opposing one another during the pptn. of colloids by electrolytes. For univalent ions one set of these factors predominates, while in the case of trivalent ions another set plays the chief role. The two sets largely offset each other when bivalent ions are responsible for the coagulation. The factors discussed are cond., valency and the concomitant action of the other ions that bear the same charge as the colloid. [ABST.—This phenomenon has been explained on another basis by Kruyt and van der Spek, *C. A. A.* **14**, 1472.]

E. B. SPEAR

The swelling of colloid mixtures. I. H. HANDOVSKY AND A. A. WEIL. Halle. *Kolloid-Z.* **27**, 306-11(1920).—The addition of 0.3 g. C or less to 1 g. dry gelatin made to a 20% gel does not affect the swelling of the gel; more than 0.3 g. C reduces the swelling, while a gel composed of gelatin and lipid swells more than pure gelatin gel. H. and W. consider that there is an adsorption compd. of the gelatin with the admixed substance and a distribution of the adsorbed water between the gelatin and the added C or lipid.

H. I. MATTELL

Colloidal adsorption. A. MUTSCHELLER. *J. Am. Chem. Soc.* **42**, 2142-60(1920).—A series of physical measurements was made upon gelatin sols prepd. and maintained under uniform, carefully controlled conditions, and varying only with respect to the concn. of an electrolyte, $ZnSO_4$. As the concn. of $ZnSO_4$ increases up to and above 0.28 molar the charge on the colloidal particles is positive, zero (at 0.28 molar) then negative as indicated by their direction of migration. The migration velocity of the anions is zero until above 0.28 molar, when it increases with increasing concn. of electrolyte; that of the cations is unity up to 0.28 molar, then decreases. Anions alone are adsorbed by the colloid up to 0.28 molar, above that both are adsorbed. At 0.28 molar $ZnSO_4$ the viscosity of the sol and the rate of swelling of dry gelatin in a soln. of the electrolyte reach a max.

H. I. MATTELL

Adsorption by silica gel. E. B. MILLER. *Chem. Met. Eng.* **23**, 1155-60, 1219-22, 1251-4(1920).—In this series of papers are first considered the basic facts and observations on adsorption of vapors by silica gel. The factors influencing adsorption are (1) the "corresponding pressure," or the ratio of the pressure of the vapor in equil. with the adsorbent to the v. p. of the liquid at the temp. of adsorption (P/P_0); and (2) the compressibility of the adsorbed liquid. The adsorbent must possess as large an internal vol. as possible made up of spaces of minimum dimensions. These attributes are possessed by silica gel, 1 g. of which will adsorb 0.41 cc. H_2O in its ultra-microscopic pores. Better adsorption is obtained the lower the temp. or the greater the concn. Inasmuch as the adsorptive power of silica gel does not depend upon any specific chem. action but rather upon the physical properties of the vapor to be adsorbed, it may be used successfully at ordinary temps. and atm. pressure to remove from air the vapors of any liquid mixed with it in any proportions, provided the liquid boils

under atm. pressure above -10° . However, even the permanent gases may be adsorbed in vapor phases at temps. below the critical point. In order to recover the adsorbed vapor it is necessary only (1) to raise the temp. and (2) decrease the partial pressure of the vapor over the gel by evacuation or displacement. Exptl. results on a lab. scale on adsorption and recovery of SO_2 , Et_2O , Me_2CO , C_6H_6 , H_2O and gasoline are shown in tables and diagrams, and static and dynamic methods of detn. are described. In the case of SO_2 by raising the temp. to 100° the gas is almost completely recovered and hence it is possible to regain the gas in any desired concn. by proper regulation of the air used to displace it, and even practically to 100% by evacuation instead of displacement. This is, of course, of great importance in the manuf. of H_2SO_4 . One of the most valuable industrial uses of silica gel is to be found in solvent recovery by steam displacement as shown by results with the above liquids. Others are: air drying for blast furnaces, gasoline recovery, recovery of industrial vapors and selective sepn. of mixed gases. The final portion of the discussion is devoted to a description with diagrams and typical plant testing records of vertical, cylindrical and bed-type absorbers.

G. L. CLARK

Colloid chemical aspects of the theory of indicators. G. WIEGNER. Zürich. *Mitt. Lebensm. Hyg.* 11, 216-27 (1920).—Wm. Ostwald's electrolytic dissociation theory of the action of org. indicators and Hantzsch's theory of mol. rearrangement have proved very useful, but cannot account for the behavior of all indicators. Wo. Ostwald found by ultramicroscopic examn. of a large number of indicators that more than half were colloidal and only a fifth were optically empty. The action of many indicators is, therefore, to be explained on the basis of colloid chem. considerations. Such indicators are usually negatively charged suspensoids whose degree of dispersion depends upon the H-ion concn., being less the greater the acidity. The color changes follow Ostwald's rule that increase in size of particles shifts the color toward the blue. A synthetic indicator can be made of colloidal gold with casein as protecting colloid. Congorubin is an excellent example of this type of indicator. It is blue in acid, red in alk. soln. The blue form has the larger particles, as shown by ultramicroscopic examn., dialysis, diffusion, ultrafiltration, and capillary analysis. Salts tend to give the blue color, the effect increasing with the valence of the cation, in agreement with Schulze's rule. With $\text{Ba}(\text{OH})_2$ the color remains blue because influence of the bivalent Ba^{++} overbalances that of the univalent OH^- . Emulsoids such as casein, gelatin, etc., exert a protecting action just as they do with colloidal gold. The "protein errors" of indicators and their sensitization by salts are to be explained by considerations such as these.

F. L. BROWNE

Investigations of sodium oleate solutions in the three physical states of curd, gel and sol. MARY E. LAING AND J. W. MCBAIN. Univ. Bristol. *J. Chem. Soc.* 117, 1508-28 (1920).—At temps. between 0° and 25° Na oleate can exist as a sol, a gel and a curd. The sol and gel are identical with regard to elec. cond., lowering of vapor pressure, n and concn. of Na^+ , and differ only in elasticity and rigidity. From this it is concluded that the chem. equilibria are the same in both systems. The curd consists of long, felted fibers of hydrated soap. The exptl. work involved measurements of elec. cond., n , vapor pressure, d., mol. wt. and I no. An accurate account is given of the prepn. of the solns. and the analytical methods employed. The various theories of gel structure are discussed. It is held that the quant. identity of sol and gel renders all theories of gel structure untenable except that of Nägeli. The characteristic phenomena of gels such as syneresis, swelling, peptization, elasticity, coagulation, optical and ultramicroscopical properties, etc., are in harmony with the view that a gel consists of a thread-like micellar structure, where the particles are in a condition of fairly definite orientation. When a gel melts to form a sol, because of a rise in temp., this orientation largely disappears. During the formation of a curd, on the other hand,

hydrated soap is removed from the soln. to form long fibers. This view is supported by the fact that the elec. cond. of the curd is much lower than that of the sol or gel, and further that the cond. falls off with the lapse of time. The fibers become more hydrated and less sol. as the aging process progresses. A distinction must, therefore, be made between gelatinization and coagulation. The latter much more nearly resembles the phenomenon of crystn. A sol was made of equiv. quantities of Na oleate and Na palmitate. When the soln. was allowed to cool to a suitable temp. the Na palmitate formed a curd, while most of the Na oleate remained in the mother liquid. The sepn., however, was not quite complete. It will be seen that this process somewhat resembles fractional crystn. A com. transparent soap is to be considered as a gel, while a hard soap is composed of a curd structure in which a gel is enmeshed.

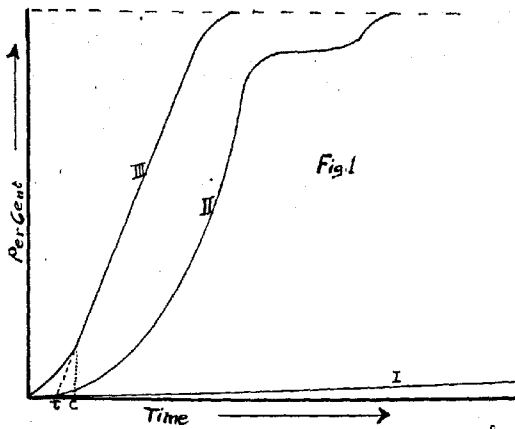
E. B. SPEAR

The viscosity-concentration function of polydispersed systems. H. LÜRRS AND M. SCHNEIDER. Munich. *Kolloid-Z.* 27, 273-7 (1920).—The relation of viscosity to the concn. of polydispersed systems of flour and water (rye, wheat, malt and barley flour) is expressed by $\eta_s = \eta_0 (1 + kf + k_1 f^n)$ in which η_s = the viscosity of the suspension, η_0 = that of water (1), f = the ratio of the vol. of the dispersed phase to the total volume, k , k_1 and n are consts. This is similar to the equation of Ostwald and Mündler for the osmotic pressure of dispersoids (*C. A.* 13, 1412). The theoretical equation of Hess (*C. A.* 14, 3176) $\eta_s = \eta/(1 - \alpha k)$ in which k is the vol. of the dispersed phase in unit vol. of the system and α a function of the vol. due to the "dead space" about each particle, fits the observed viscosities about equally well.

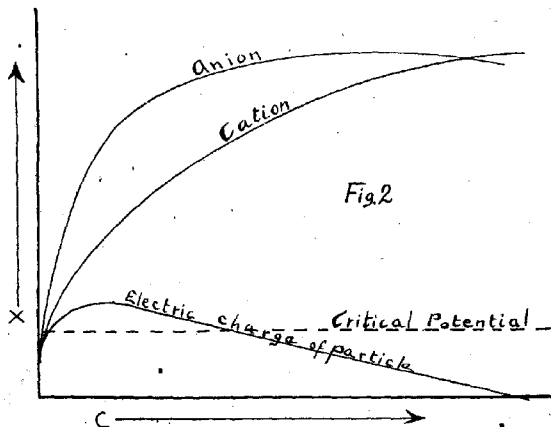
H. I. MATTILL

The structure of precipitates. SVEN ODÉN. *Scensk Kem. Tidskrift* 32, 74-85, 9098, 108-110 (1920).—Ppts. formed in ionic reactions consists of single-grain particles (primary particles). The size (radius, r) of the particles is detd. by the manner in which the solns. are poured together, temp., and the concn. of the electrolytes. Primary particles remain in their single-grain structure only in the presence of a definite concn. of electrolytes (critical concn.). The concn. of an electrolyte necessary to maintain the primary particles as such is characteristic of the suspended particle and of the salts in the soln. The critical concn. may on the one hand be very narrow in range (perhaps less than 0.001 mol.) or on the other hand have rather wide limits (as in the authors expts. with BaSO_4 -potassium citrate, 0.001 to over 1.0 mols.). When the amt. of the electrolyte passes the critical concn. the primary particles unite to form aggregates (secondary particles). The size (r) of the secondary particles is dependent upon the elec. charge of the primary particle as detd. by its r , also by the concn. of the primary particles and the concn. of the electrolytes in soln. In the majority of ppts. from ionic reactions the r of the particles attains a fixed max., which is detd. by the electrolyte concn. When a ppt. consisting of secondary particles is shaken up in water the particles are resolved into their primary particles. Such primary particles reaggregate when the fluid comes to rest. In re-forming secondary particles these assume a size appropriate to the concn. of electrolytes present, and if this concn. has been changed to a point nearer the critical concn., the r of the re-formed particles will be less than of the original secondary particles. By careful adjustment the r may in this manner be reduced to the r of the primary particles (disaggregation). Such secondary particles are said to be reversible. If primary particles are brought so closely together that they come within their spheres of adhesion (or cohesion) they will not disaggregate and are said to be irreversible. Irreversibility was accomplished by centrifuging and also by partial desiccation. The suspended material used in this work was BaSO_4 . Some of the facts noted were checked by similar expts. on kaolin and S. Confirmatory references are made to expts. on colloidal gold (Westgren, *C. A.* 14, 1245). The BaSO_4 was for the most part pptd. from $\text{Ba}(\text{NO}_3)_2$ by $(\text{NH}_4)_2\text{SO}_4$. Inasmuch as the NH_4NO_3

is adsorbed by the BaSO_4 , $\text{Ba}(\text{CNS})_2$ was employed in prep. the suspension whenever a ppt. free from electrolytes was needed. Measurements were made (1) by microscopic and ultramicroscopic count, and (2) by weighing the accumulating sediment at given time intervals (cf. Oden, *C. A.* 10, 2429). Two kinds of curves are plotted: (1) ac-



cumulation curves with the abscissa as time in sec. and the ordinate as % of the total; (2) distribution curves, in which the abscissa represents the $\ln r$ (r also given in μ) and the ordinate the amt. of particles for any r . An accumulation curve may be one of three types (see Fig. 1): (I) primary particles; (II) irreversible secondary particles;



(III) reversible secondary particles. Curve III indicates that a short time after the formation of the primary particles the secondary particles are formed all at once and an equil. is established. This aggregation time (τ) may be ascertained by extending

the straight line segment of the curve until it intersects the abscissa. The time interval between τ and the juncture between the first two segments of the curve (C) is employed in calculating the size of the particles (Stokes law?). The number of particles $\times \tau = \text{const.}$ With a decrease in the potential of the primary particle there is an increase in the number of primary particles in the aggregate. The author conceives the potential of the particles as dependent upon the anions and cations adsorbed, and this in turn upon the r of the particle, also the chem. nature of the particle and the individual ions of the coagulator. See Fig. 2. The data from three lines of his table are here submitted by way of illustration: M (mol./L.): 0.086, 0.114, 0.54; τ (sec.): 3090, 960, 124; no. of aggregates (calcd. from $C - \tau$): 13.0×10^{12} , 1.1×10^{13} , 104×10^4 ; no. primary particles in aggregate: 50, 570, 60,000. The following samples are selected from the authors' distribution curves to indicate the influence of concn. of electrolytes on the r of the primary particles. $M = 0.01$; 46% of the particles are less than 0.2μ , the largest particle does not exceed 0.8μ in r , the greatest number of particles occurs at about 0.26μ . $M = 0.001$; 13.7% of the particles are less than 0.3μ , 5% are approx. 1.0μ or over, and the greatest number at about 0.5μ . $M = 0.001$; rarely any particles under 0.5μ in r , the vast majority are between 0.5 and 1.3μ and many in excess of the last value. With concns. greater than $M = 0.25$ the particles are too small to give regular curves. The particles are less than 0.2μ in r . They are difficult to handle forming gelatinous globules. With an increase of the particles to more than 0.2μ the particles take on a cryst. structure more readily distinguished as the size increases and being easily noted in three dimensions when the concn. of the electrolyte was limited to $M = 0.00083$. If the temp. is increased at the time of pptn. there is an increase in the r of the primary particles but there is no appreciable increase in the r if the temp. is increased after the particles have formed (growth of crystals, cf. Wm. Ostwald). A suspension of BaSO_4 was boiled for 100 hrs. The number of particles under 0.2μ in r was decreased from 47 to 30%, the peak was moved from about 0.28 to 0.3μ . This work will appear in more detail in *Arkiv. Kem. K. Vet. Akad.* 7, No. 26 (1920).

A. R. ROSE

The lowering of the vapor pressure of water at 20° produced by dissolved potassium chloride. B. F. LOVELACE, J. C. W. FRAZER AND V. B. SEASE. Johns Hopkins Univ. *J. Am. Chem. Soc.* 43, 102-10 (1921); cf. *C. A.* 9, 403.—The lowering of the vapor pressure of aq. solns. of KCl ranging from 0.05 to 4.0 N has been measured at 20° by the static method previously employed. It has been found that the mol.-lowering curve is irregular, passing through a minimum at about 1.0 M . Values calcd. for the vapor pressure of KCl solns. at 20° from f. p. data by means of Babo's law and an equation connecting f. p. lowering with vapor pressure, vary from about 3% greater than the observed values in the dil. solns. to about 6% less than the observed values in the concd. solns. Values for the percentage ionization of dil. solns. of KCl have been calcd. from the vapor pressure lowering data. These agree well with the best values from f. p. and cond. data.

H. JERMAIN CREIGHTON

Measurement of vapor pressures of certain potassium compounds. DANIEL D. JACKSON AND JEROME J. MORGAN. Columbia Univ. *J. Ind. Eng. Chem.* 13, 110-8 (1921).—The authors regard the vapor pressures of the K compds. involved as fundamental in the study of the volatilization of potash. The method of von Wartenberg (*C. A.* 7, 3893) was used. The following vapor pressures in mm. Hg are reported: KOH at 795° 8, KCl at 801° 1.54, at 948° 8.33, at 1044° 34.1; K_2O in K_2CO_3 at 970° 1.68, at 1130° 5.0; K_2SO_4 at 1130° 0.4; natural silicates, glauconite, orthoclase and leucite up to 1335° nil. For KCl the Nernst vapor pressure formula is calcd. to be $\log P = (-5326/T) + 1.75 \log T + 0.000511 T - 0.7064$. This is based on the results of the authors at 800° and 1044° and the b. p. which Borgstrom (*C. A.* 9, 2861) found to be 1500° . The mean value for the heat of evapn. $\lambda = -30,800$ is obtained by van't Hoff's equation. The article also contains a detailed drawing of a high-temp.

Mo-wound *electric furnace* and a full discussion of the *vapor pressure method*. The authors have shown that the order of volatility of the compds. important in the recovery of potash by volatilization is: KOH, KCl, K_2O from K_2CO_3 , K_2SO_4 , natural silicates.

JEROMS J. MORGAN

The optical and electrical axes of symmetry of monoclinic crystals. H. RUBENS. *Z. Physik*. 1, 11-31(1920); cf. *Ber. preuss. Akad. Wiss.* 1919, p. 976.—The positions of the optical axes (directions which specify the greatest and least values of the reflection) in the (010)-plates of the monoclinic crystals gypsum, augite and adularia are detd. for very long waves. They are also obtained by measuring the transmission for these three crystals (and for a similarly cut section of cane sugar), the directions of greatest reflection coinciding with those of least transmission. The positions of these axes change rapidly with the wave length for waves between $\lambda = 22 \mu$ and $\lambda = 110 \mu$ in the case of adularia; but for longer waves than this the variation is slight. For gypsum and augite this region of practical constancy is reached when $\lambda = 83 \mu$. According to the electromagnetic theory the position of the elec. axes (defining the directions of greatest and least values of the dielectric constant) should be approached by the optical axes for very long waves. Finding the existing data in disagreement with this conclusion, the dielec. axes for these three crystals have been redetd. These new results show that the elec. axes have practically the same positions as have the optical axes for very long waves, thus furnishing "a new confirmation of the electromagnetic theory of light."

RALPH W. G. WYCKOFF

The crystal structures of the ammonium halides above and below the transition temperatures. GUY BARTLETT AND IRVING LANGMUIR. *Gen. Elec. Co. J. Am. Chem. Soc.* 43, 84-91(1921).—By the method of powders the atoms in the high-temp. forms of NH_4Cl , NH_4Br and NH_4I are found to have the same relative arrangement as have the corresponding atoms in NaCl. The low-temp. modifications of NH_4Cl and NH_4Br exhibit a body-centered arrangement wherein each NH_4 group is equally near to 8 halogen atoms and each halogen atom to 8 NH_4 groups. These results are considered to "furnish confirmatory evidence that the NH_4 ion has tetrahedral symmetry while the alkali and halogen ions are cubic in shape."

RALPH W. G. WYCKOFF

Degrees of freedom (variance) and the methods of estimating the number without the aid of any formula. C. RAVEAU. *Compt. rend.* 170, 1385-7(1920).—This note is a general consideration with examples of the meaning of variance or degrees of freedom—the no. of independent changes which a phase can undergo, or the no. of independent ways for changing the phase from a given state of a certain system—based directly upon the conception of Gibbs, and embodying nothing distinctly new. G. I. CLARK

The determination of the number of independent constituents. The rule of M. Dubreuil. The action of water on a mixture of salts. C. RAVEAU. *Compt. rend.* 171, 913-6(1920).—In certain salt mixts. the phase rule as ordinarily interpreted does not give us a reliable idea of the number of independent components of a system. E. g., in the system starting with NH_4NO_3 and NaCl or $NaNO_3$ and NH_4Cl , one of the above pairs of salts is the more stable. The reaction goes irreversibly, with a trace of water to catalyze it, $NH_4NO_3 + NaCl = NaNO_3 + NH_4Cl$. Starting, then, with the left-hand pair and adding increasing amts. of water we have at first always a soln. of fixed concn. in equil. with 3 salts, of which two are always $NaNO_3$ and NH_4Cl . Finally a soln. of variable compn. in equil. with 2, and then with 1 salt. Starting with NH_4Cl and $NaNO_3$, however, we have a soln. of fixed compn. until 1 salt is completely dissolved, and then a soln. of variable compn. in equil. with 1 salt. Gibbs' rule would lead to different results.

A. E. STRARN

Note on the theory of monomolecular reactions. RICHARD C. TOLMAN. *J. Am. Chem. Soc.* 43, 269-74(1921); cf. *C. A.* 15, 459.—A theoretical and mathematical paper. The significance of the quantity of s , in the equation $k = se^{Q/RT}$ (where k

is the sp. reaction rate, s is a quantity having the dimensions of frequency, and Q is a quantity having the dimensions of energy), is discussed in the case of a monomol. reaction; and the points in favor of and against Dushman's method of procedure (cf. *J. Frank. Inst.* 189, 515(1920)) in postulating the identity of s and ν are considered.

H. JERMAIN CREIGHTON

Reaction of oxalic upon iodic acid. Influence of temperature and dilution. GEORGES LEMOINE. *Compt. rend.* 171, 1094-1100(1920).—The reaction $\text{H}_2\text{C}_2\text{O}_4 + 2/5\text{HIO}_3 = 2\text{CO}_2 + 2/5\text{I} + 6/5\text{H}_2\text{O}$ is shown to be of the second order. At first the reaction is slower than predicted, owing to the fact that the free iodine which is first formed and dissolves accelerates it and it does not become a true second-order reaction until the soln. becomes satd. with the iodine. The temp. coeff. of velocity is found to be about 3.7, while the velocity const. k is roughly proportional to the concn., though not greatly affected by it.

A. E. STEARN

The hydrolysis of urea hydrochloride. G. J. BURROWS. *J. Proc. Roy. Soc. N. S. Wales* 53, 125-35(1919); cf. *C. A.* 14, 2440.—In detg. the degree of hydrolysis (h) of $\text{CO}(\text{NH}_2)_2\cdot\text{HCl}$ in H_2O -EtOH mixts. the amt. of free HCl present was detd. from the rate at which it inverted sucrose solns. (*C. A.* 8, 2368, 3024). The rate of inversion of the sucrose soln. by HCl (k_1) was first detd. and then the rate of inversion by HCl containing the required amt. of $\text{CO}(\text{NH}_2)_2$ (k_2). By assuming the rate of inversion as proportional to the amt. of free acid, h is expressed as the ratio k_2/k_1 . The inversion velocity is influenced by the presence of unhydrolyzed salt so k_2/k_1 does not express exactly the degree of hydrolysis. Correction for this was made by detg. the effect on the rate of inversion caused by the addition of an amt. of NaCl equal to that of the unhydrolyzed salt and assuming that this gave approx. the effect of the unhydrolyzed salt on the reaction. h and the hydrolysis factor H ($H = h^2/(1 - h)^2$, in which ν is the vol. in l. which contains 1 g. mol. of $\text{CO}(\text{NH}_2)_2\cdot\text{HCl}$) were found for 0.5 *M* $\text{CO}(\text{NH}_2)_2\cdot\text{HCl}$ at 25° and 30° and for 0.1 *M* $\text{CO}(\text{NH}_2)_2\cdot\text{HCl}$ at 40° in various H_2O -EtOH mixts. The results indicate that in these mixts. the effect of diln. may be expressed by the ordinary diln. law—that is, the amt. of salt hydrolyzed depends on the concn. of the salt expressed in terms of the total vol. Similar expts. with H_2O -Me₂CO mixts., in which the concn. of free HCl was detd. by its effect in hydrolyzing MeOAc, indicate that Me₂CO has no hydrolytic effect on $\text{CO}(\text{NH}_2)_2\cdot\text{HCl}$.

G. W. STRATTON

Catalytic studies. VII. Iodine-iodine ion catalysis of hydrogen peroxide. E. ABEL. *Monatsh.* 41, 405-21(1920).—A mathematical formulation of the conditions for the occurrence of the I-I' catalysis of H_2O_2 .

C. J. WEST

The catalytic decomposition of hydrogen peroxide by sodium iodide in mixed solvents. VAN L. BOHNSON. *J. Phys. Chem.* 24, 677-700(1920).—The gasometric method and app. such as described by Walton (*Z. phys. Chem.* 47, 185(1904)) were used to measure the velocity of the catalytic decompn. of H_2O_2 by NaI in aq. mixt. of Me, Et, Pr, iso-Bu, and Am alcs., glycerol and pyridine. The decompn. of the H_2O_2 is complete and the solvents apparently do not undergo oxidation. The following relative constants for the velocity of reaction in the pure solvents were found: MeOH, 23, EtOH, 45; PrOH, 164; iso-BuOH, 397; AmOH, 537; glycerol, 376; pyridine, 7; H_2O , 128.7; gelatin soln. (of marked viscosity) 94.3. No apparent relation exists between the velocity of the reaction and the dielec. const., viscosity, or surface tension of the pure solvent. In the mixts. the minima in the reaction velocity curves when any exist, do not correspond with the minima in the fluidity curves, and no relation has been found to hold between the reactional velocity and any physical property of the mixed solvent. The solvent appears to exert a sp. effect on the velocity of a reaction, this effect being probably the resultant of a number of other effects due to the solvent's association, viscosity and surface tension, the catalyst's dissociation, and a possible reaction between the solvent and dissolved substances.

C. C. VAN VOORHIS

The catalytic combustion of cane sugar. L. BRANDT. *Chem.-Ztg.* **44**, 881-2(1920).—B. has extended the work of Thomae (*C. A.* **14**, 1243) and finds that it is not the Fe_2O_3 in cigar ash which induces the combustion of the sugar, but the alkali carbonates. Expts. with a large number of solids, liquids, and solns. showed that catalytic oxidation is not essential, but that in general those substances which are wet by melted sugar catalyze its combustion. As soon as a small portion of the sugar is carbonized, it acts like a wick, and the combustion proceeds. Effective substances act in soln. as well as when applied in solid form. A comprehensive theory of the phenomenon cannot be formulated as yet, but it is certain that its causes are purely physical. F. W. Z.

Specific heat investigations at low temperatures. PAUL GÜNTHER. Berlin. *Ann. Physik* **63**, 476-80(1920).—Former exptl. work of Nernst, *et al.* (*C. A.* **4**, 2397; **5**, 2763; **8**, 3145), was continued with improvements: (1) A diffusion pump was much steadier than the former mol. pump, hence a glass spiral could be omitted, and better exhaustion obtained; (2) the lead wires were finer and coiled, so that heat conduction was diminished; the temp. drift was usually less than half of that previously observed. Data for Na, for Sb, and for Li hydride were obtained from about 80° K to 120°. The results agreed within 5%, usually 2% or better with theory. W. P. WHITE

The isotherms of hydrogen. L. HOLBORN. Reichsanstalt. *Ann. Physik* **63**, 674-80(1920).—The values found were: for 0° $p_v = 0.99918 + 0.00082094p + 0.0000003745p^2$; 50° $p_v = 1.18212 + 0.00089000p$; 100° $p_v = 1.36506 + 0.00091400p$. The agreement with others' recent work is usually to better than 1 per mille up to 20°; a little worse at 100°. Amagat is 5 per mille higher at 0°. W. P. WHITE

The molecular heat of hydrogen. F. H. MACDOUGALL. *J. Am. Chem. Soc.* **43**, 23-8(1921).—Calcs. based on Bohr's theory indicate that the observed mol. heat of H is inconsistent with the assumption of 2 degrees of rotational freedom (5 degrees of freedom, all told) but consistent with 3 degrees of rotational freedom. W. P. W.

Relation between the thermal conductivity and viscosity of gases. J. A. POLLOCK. *J. Proc. Roy. Soc. N. S. Wales* **53**, 116-9(1919).—Tables are given in which the values of f for different gases as calcd. from the empirical form of Hércus and Laby ($f = 2816\gamma - 2.2$ (2)) and from the expression of P. ($f = 6.15(\gamma - 1)/\gamma$ (3)) are compared with those given by the defining equation $f = \gamma k_0/\eta_0 C_p$ (k = thermal cond.; C_p = sp. heat at const. pressure, γ = ratio of sp. heats, η = viscosity). Equation (3) has the advantage over (2) in that it indicates for perfect gases a simple approx. relation between the thermal cond. and viscosity which may be put in the form $m\gamma k_0/\eta_0 = 2a$ where m = mol. mass and a = const. of equation (3). Values for $2a$ for the different gases and the const. used in the calcs. are also given in tabular form. G. W. STRATTON

The thermal decomposition of gaseous nitrogen pentoxide. FARRINGTON DANIELS and ELMER H. JOHNSTON. *J. Am. Chem. Soc.* **43**, 53-71(1921).—The decompn. of gaseous N_2O_5 at room temp. takes place in accordance with the monomol. reaction equation. The rate of decompn. has been measured between 0 and 65°. The following values are given for the velocity const.: 0.0000472 at 0°, 0.000624 at 15°, 0.00117 at 20°, and 0.00191 at 25°. It is shown that the critical increment (av. value = 24,700 cal.) is independent of the temp. between 0 and 65°. H. JERMAIN CREIGHTON

The photochemical decomposition of nitrogen pentoxide. FARRINGTON DANIELS and ELMER H. JOHNSTON. *J. Am. Chem. Soc.* **43**, 72-81(1921); cf. preceding abstract. —The acceleration of the decompn. of N_2O_5 at 0° by black-body radiation from the vessel walls, and by radiation received from a body emitting white light has been studied. The acceleration due to the former is negligible in comparison with that produced by the latter type of radiation. From the value 24,700 cal. for the critical increment, $E = Nh\nu$, λ has been found to be 1.16 μ , although this wave length does not decompose N_2O_5 within the limit of exptl. observation. Its decompn. is accelerated by light in

the region 400–600 $\mu\mu$, but between 400 and 460 $\mu\mu$ the dioxide must be present.

H. JERMAIN CREIGHTON

Determination of the thermal conductivity of water in the region from 0° to 80°. MAX JAKOB. *Reichsanstalt. Ann. Physik* 63, 537–70(1920).—Other work is carefully reviewed. The method was to pass heat downward through a layer of water over 2 mm. thick and 10 cm. in diameter, held by capillary attraction between 2 Cu plates. The specialty of the method was the care used in detg. the various heat losses. The cond. from 7° to 72° was found to be $0.001325(1 + 0.002984t) \pm 0.000010$. W. P. W.

The heat of vaporization of a liquid. E. ARIS. *Compt. rend.* 171, 986–9(1920).—A reply to criticism by Bruhat (*C. A.* 15, 205) containing no new material.

E. D. WILLIAMSON

Zero absolute. WYOLD KASPEGROWICZ. *Elektrochem. Z.* 27, 31–3(1920).—Many of the apparent discrepancies in the properties of various substances at or near zero absolute are discussed and it is suggested that it would be far better for us to assume that every substance has a specific "zero absolute" point, not necessarily the same as that of any other substance. C. G. F.

The present status of the ionic theory. J. HEVROVSKY. *Chem. Listy* 14, 1746–(1920).—A review. JOHN M. KRNO

Further investigations on the dissociation of ternary electrolytes. C. DRUCKER. *Leipzig. Z. physik. Chem.* 96, 381–427(1920); cf. *C. A.* 8, 854; 14, 3560.—The dissociation ratios of H_2SO_4 , $H_2C_2O_4$, $H_2C_4H_4O_6$ and their K and Tl neutral and acid salts have been studied at 18°. The ionic concns. were detd. electrometrically in some cases, and in others cryoscopically; cond. measurements were also employed. It has been found that solns. of the above mentioned electrolytes follow the law of mass action up to a concn. $C = 0.04 N$, and in some cases to even higher concns. For some of the solns. it has been shown that the formation of complexes sets in at the higher concns. The mobility (h) of the primary ion MA^- of salts of the type M_2A can be calcd. by means of the formula $h_1^{--} - h_{MA}^- = a \text{ const.} = 0.30$. The following values have been obtained for the mobility of the designated primary ions: $TlSO_4^- = 116$, $KSO_4^- = 115$, $HClO_4^- = 30$, $KC_2O_4^- = 103$, $TlC_4H_4O_6^- = 88$, $HCl_2H_4O_6^- = 17$, $KC_4H_4O_6^- = 85$. With the help of these values the following dissociation consts. have been calcd. $(K^+)(KSO_4^-)/(K_2SO_4) = 1.5$, $(K^+)(SO_4^{--})/(KSO_4^-) = 2 \times 10^{-3}$, $(H^+)(HSO_4^-)/(H_2SO_4) = 0.21$, $(H^+)(SO_4^{--})/(HSO_4^-) = 1.7 \times 10^{-3}$, $(Tl^+)(TlSO_4^-)/(Tl_2SO_4) = 0.23$, $(H^+)(HC_2O_4^-)/(H_2C_2O_4) = 5.7 \times 10^{-3}$, $(H^+)(C_2O_4^{--}) = 6.9 \times 10^{-3}$, $(Tl^+)(TlC_2O_4^-)/(Tl_2C_2O_4) = 2.3 \times 10^{-2}$, $(Tl^+)(C_2O_4^{--})/(TlC_2O_4^-) = 1.1 \times 10^{-2}$, $(K^+)(C_2O_4^{--})/(KC_2O_4^-) = 1.6 \times 10^{-2}$, $(H^+)(HC_4H_4O_6)/(H_2C_4H_4O_6) = 1.17 \times 10^{-3}$, $(H^+)(C_4H_4O_6^{--})/(HC_4H_4O_6^-) = 2.9 \times 10^{-3}$, $(Tl^+)(TlC_4H_4O_6^-)/(Tl_2C_4H_4O_6) = 2.0 \times 10^{-1}$, $(Tl^+)(C_4H_4O_6^{--})/(TlC_4H_4O_6^-) = 5.6 \times 10^{-3}$. In conclusion it is pointed out that the results of the investigation widen our conception of electrolytic dissociation, since they show the electrostatic correction magnitudes of Malström and the assumption of total dissociation far above infinite diln. to be unnecessary. H. J. CREIGHTON

Electrical conductivity of potassium, sodium and barium chlorides in mixtures of pyridine and water. JNANENDRA CHANDRA GHOSH. *Univ. College, London. J. Chem. Soc.* 117, 1390–6(1920); cf. *C. A.* 12, 2268.—Dielec. consts. of various mixts. of pyridine and water are detd. by the Nernst method. Values of the equiv. conds. of the salts NaCl, KCl, and BaCl₂ are detd. in a given mixt. of pyridine and water the dielec. const. of which is accurately known. From one of these values of the equiv. cond., values corresponding to the other dilns. are calcd. in each case, by means of the equations, $(NE^2\sqrt{2N/D^2RT})\{(1/\sqrt{V_1}) - (1/\sqrt{V_2})\} = \log(\mu_{\infty}/\mu_{01})$ for univalent binary electrolytes, and $6NE^2\sqrt{2N/D^2\sqrt{3(3RT)}}\{1/\sqrt{V_1} - 1/\sqrt{V_2}\} = \log_6 \mu_{\infty}/\mu_{01}$, univalent electrolytes, which were derived in the preceding paper. In the equations N is Avogadro's number, E is the absolute charge on an ion, V is the mol. diln. and D

is the dielec. const. of the solvent. The values so calcd. check the actual exptl. values within the limits of exptl. error.⁹ The material is presented in confirmation of the hypothesis of complete ionization of strong electrolytes. Other data on the cond. of LiNO_3 are recalc'd.

C. R. PARK

The electrical conductivity of solid salt mixtures. A. BENRATH AND H. TESCHE. Univ. Bonn. *Z. physik. Chem.* 96, 474-82(1920); cf. *C. A.* 3, 610; 6, 176.—The cond. of a large number of mixts., of varying compn., of the following systems has been detd.: LiCl-KCl at temps. between 290 and 350°, $\text{NaNO}_3\text{-LiNO}_3$ at temps. between 180 and 270°, and $\text{PbCl}_2\text{-SnCl}_2$ at temps. between 100 and 480°. Attempts have been made to det. the cond. of the system $\text{LiNO}_3\text{-KNO}_3$, but it was not possible to obtain the mixt. free from H_2O . The results of the measurements show that those schemes for the cond. isotherms of salt mixts. that have been reproduced from those put forward for metal alloys are not sufficient. It has been found that the points at which an eutectic occurs are conspicuous points on the cond. isotherm. The protracted cond. curves promise to give an insight to the problem the measure in which the cond. is divided between the components.

H. JERMAIN CREIGHTON

Variation of the conductivity of calcium sulfide with temperature. P. VAILLANT. *Compt. rend.* 171, 1380-3(1920).—The elec. conductance of a thin layer of CaS increases rapidly with the temp., passing through a sharp max. and then falling off to practically zero. A series of measurements is given in which the cond. in arbitrary units (C) varies from 13 at 18.5° to 1958 at 57.5°. V. considers that the equation holds: $C = C_0 e^{\beta(T-T_0)(1-(T/t_0))}$, where C_0 , t_0 , T_0 and β are consts. $C_0 = 8.33$, $t_0 = 100$, $T_0 = 15.1$ and $\beta = 0.130$ for the case in question.

F. H. DARBY

Conduction of electricity and the constitution of liquid metals and alloys. FRANZ SKAUPY. *Physik. Z.* 21, 597-601(1920).—Liquid metals and alloys offer analogies to solns. of electrolytes, and are better suited to exptl. cond. studies than solid metals. The cond. of liquid Hg is increased by the soln. of minute amts. of metals like Zn , Pb and Cd , but decreased by alkali metals. The latter alloys possess greater internal friction than the former. Elec. cond. of pure solvent, as well as dil. solns., must be represented as a function of internal friction of the metals and the electron concn. Dil. metal solns. have a higher electron concn. than the solvents themselves in cases where the solute dissociates. Between solvent and solute chem. equil. must exist, as both contain common ions, or electrons. Changes in electron concn. of pure solvent through temp. and pressure must be related to the equil. With passage of elec. current through fluid alloys there must be changes in concn. The above statements are also expressed mathematically, and exptl. results given supporting them. Expts. by Lewis *et al.* on transference numbers of alkali metal amalgams indicate that the alkali metals migrate to the anode. This may be explained by assuming that when a current passes the positive ions go to the cathode, but as the liquid as a whole retains its position a corresponding part of the remaining alloy, with its alkali, must be forced to the anode—an effect favored by the internal friction of the alkali amalgam. Calcn. of dissociation of Hg by different methods yields concordant results. Stokes law can be applied to the ion as to the mol., and it now appears that it can be used with electrons also. Knowledge of electron concn. in fluid alloys also gives information about a metal in the solid form at temp. near its m. p., for upon melting no essential difference in the number of electrons takes place. This is not incompatible with the fact that thermal forces exist between solid and liquid metals at the m. p., for these forces are small and, according to Thompson's formula, yield a change of only a few % in the concn. of the electrons.

W. C. EBAUGH

Transference numbers of liquid amalgams. FRANZ SKAUPY. Berlin. *Z. Physik.* 3, 178-81(1920).—S. explains the increase in concn. at the anode in the electrolysis of dil. alkali amalgams by supposing that the positive Hg ion carries with it a certain

number of neutral Hg atoms and the alkali metal associated with them. On this assumption the transference number would be $(u/v)(1+z)(e/100)$, where u is the mobility of the Hg cation, v the mobility of the electrons, z the number of neutral Hg atoms for each cation and e the concn. of the alkali metal. From the cond. of Hg, $1/v = 0.62z$, where e is the degree of dissociation of Hg into cations and electrons. A value of e calcd. from this formula and exptl. data for the transference number gives, with $z = 10$, very approx. agreement with the value found by S. from Stokes' law applied to the electrons (C. A. 10, 3014).

F. C. HOYT

Observations on the zinc electrode. WM. C. MOORE. Johns Hopkins Univ. *J. Am. Chem. Soc.* 43, 81-4(1921).—Within the concn. ranges 0.5 to 0.002 N , it has been found that the method advocated by Kistiakowski (C. A. 2, 1529) is insufficient to exclude O in setting up Zn electrodes. Directions are given for prep. Zn electrodes reproducible to within ± 1 milli-v. Measurements made of the electrode potential of Zn in 0.5, 0.1, 0.01 and 0.002 N $ZnSO_4$ show that the Nernst e. m. f. formula is applicable within these concn. ranges. Notwithstanding the precautions employed, the Zn electrode has not been found satisfactory for measuring small changes in Zn-ion concn.

H. JERMAIN CREIGHTON

Thermodynamics of the normal elements. IX. The temperature formula of the normal elements and the specific heat of the salts present in these elements. ERNST COHEN, C. I. KRUISHEER AND A. L. TH. MOERSVELD. Utrecht. *Z. physik. Chem.* 96, 437-70(1920); cf. C. A. 15, 792.—A rational temp. formula for reversible galvanic chains has the form: $E = E_0 + [E_0 + (U_0/nFT_0)](T - T_0) - [(1/2nFT_0)(dU/dT)_0](T - T_0)^2 + (1/6nFT_0)\{(1/T_0)(dU/dT)_0\} - (d^2U/dT^2)_0\}(T - T_0)^3 + \dots$. Here U is the heat of reaction and the other symbols have their usual meaning. It is pointed out that U_0 as well as $(dU/dT)_0$ and $(d^2U/dT^2)_0$ may be calcd. by the thermochem. method. For U_0 in the case of the Weston element with the solid phase at 18° , the value 47,561 g.-cal. has been calcd. from data previously detd. The complete reaction mechanism of the Weston normal element is given, and it is shown that by the procedure followed by v. Steinwehr (cf. C. A. 8, 3146), for choosing between the different temp. formulas of the Weston element, it is not possible to make a correct choice. A method has been worked out for the detn. of the (true) sp. heats of salts, and by means of this the (true) sp. heat of $CdSO_4 \cdot 8/3H_2O$, $ZnSO_4 \cdot 7H_2O$ and of $HgSO_4$ has been found to be, resp. 0.2008 (at 20°), 0.3184 (between 18.5 and 22.5°) and 0.06400 (between 18.5 and 22.5°). By means of these data the value $+22.38$ g.-cal. per degree has been calcd. for $(dU/dT)_0$, but it is pointed out that at present it is not possible to evaluate $(d^2U/dT^2)_0$ by the thermochem. method. In conclusion, it is shown that v. Steinwehr's "rational" temp. formula for the Weston element is not in accordance with facts. H. J. C.

Loss of spirit strength due to evaporation. L. BRIANT AND H. W. HARMAN. *Analyst* 45, 448(1920).—The loss of EtOH by evapn. from approx. 200 cc. of spirit contained in bottles lightly covered with a watch glass and having an exposed area of about 1 sq. in. amounted in 20 days to 4.19% when the temp. was held at $60^\circ F$. and 7.13% when the temp. was $85^\circ F$.

G. W. STRATTON

Errors from paint and window in photometric sphere. F. E. CADY. *Elec. World* 77, 368(1921).—Selectivity of window and paint may cause 5% error in measurement of N- and A-filled W incandescent lamps with vacuum W comparison lamp. C. G. F.

The chemistry of odoriferous substances. M. GUERBET. *J. pharm. chim.* 22, 344-8(1920).—A summary is given of the known relations between odor and chem. constitution.

S. WALDBOTT

Two lecture experiments. ANT. VYSKOČIL. *Chem. Listy* 14, 40-3(1920).—The experiments described illustrate electrolytic dissociation and chem. kinetics. J. M. K.

Essentials of the minute structure of crystals (RINNE) 3. Crystal growth and

chemical affinity (VALENTON) 3. The closure of small cavities in rocks exposed to high pressure (JOLY) 8. Rare gases, of the natural gases of Alsace-Lorraine (MOURREU, LEPAPPE) 8. The lattice planes in isometric crystals (HAAO) 8. The Bragg crystal lattice and cleavage (SCHARIZER) 8. Laboratory applications of the triode valve (SCOTT-TAGGART) 4. Some properties of selenium oxychloride (LENHER) 6.

BANCROFT, WILDER D.: *Applied Colloid Chemistry. General Theory*. New York: McGraw-Hill Book Co. 345 pp. \$3.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

GERALD L. WENDT

The constitution of the atom. MASSON. *Chem. Eng. Mining Rev. (Australia)* 13, 68-9(1920).—An address reviewing the subject. E. J. C.

Angular momentum and some related properties of the ring electron. H. STANLEY ALLEN. Univ. Edinburgh. *Phil. Mag.* 41, 113-20(1921); cf. *C. A.* 15, 467.—A. presents a proof of a theorem of S. B. McLaren according to which the angular momentum of a magneton of any shape or dimensions about its axis of symmetry is $N_m M_e / 2\pi$ in which N_m is the number of tubes of elec. force terminating on the surface and M_e is the number of tubes of magnetic induction passing through the aperture of the magneton. Combining this with $h/2\pi$, in which h is Planck's const., $h = N_m M_e$ or $N_m = h/e$, where e is the charge on an electron. Lewis and Adams (*Phys. Rev.* 3, 92(1914)) also give a relation between h and e which leads to a simple expression for the self-inductance of the ring which may be combined with Rayleigh's formula for the induction of an anchor ring of circular cross-section. Employing Webster's expression for mass of the Parson magneton and Compton's estimate of its radius, the most important numerical consts. for the ring electron are calcd. A table of these is given from which it appears that intense local magnetic fields must exist in the neighborhood of the magneton. S. C. LIND

The effect of fluorescence and dissociation on the ionizing potential of iodine vapor. H. D. SMYTH AND K. T. COMPTON. *Phys. Rev.* 16, 501-13(1920); cf. *C. A.* 14, 3015.—Apparently, since fluorescence is not accompanied by ionization, it must result from the temporary displacement of an electron to one of the outer orbits. On this hypothesis, less work should be required to ionize a fluorescing than a normal atom or mol. The present work was done in the hope of observing this predicted reduction in the ionizing potential of I vapor. The tube was of the 3-electrode type, 1.5 cm. in diam., with BaO-coated Pt filament. The Pt gauze, shaped so as to spread the electrons towards the walls of the tube and thus to favor impact of electrons with fluorescing mols., was placed between the filament and the plate. An accelerating field was applied between the filament and the gauze, while a retarding field, larger by a const. amt., was applied between the gauze and the plate. A quartz Hg arc was used to excite fluorescence. In the fluorescent curve there are 3 distinct breaks, occurring at (a) 6.42, (b) 7.67, and (c) 9.07 v. In the normal curve the (a) break did not occur, there being only 2, occurring at (b) 7.7 and (c) 9.21 v. These are av. values for 11 runs, at pressures ranging approx. from 0.005 to 1 mm. of Hg and with values of current to the gauze ranging from 2.5×10^{-9} to 7×10^{-7} amp. The (a) break, appearing only in the fluorescent curves, is naturally attributed to the *ionization of fluorescing I mols.* It is concluded that the (b) break is due to the *ionization of I atoms*, resulting from the dissociation of mols. by the hot filament. Atomic I has no absorption bands in the visible spectrum (cf. Evans, *Astrophys. J.* 32, 1) and would not be affected by the radiation from the Hg arc. The (c) break which appeared

very strongly even with very small emission is presumably due to the ionization of normal, unexcited, diatomic I vapor. The mean value of the difference between the voltages corresponding to this (c) break and the (a) break is equal to 2.86 ± 0.04 v. and should be equal to the difference in the work needed to remove an electron from a fluorescent and from a normal mol. The difference between this observed value and the theoretical value of about 2.3 v., indicated by the work of Wood and of Mohler and Foote, may likely be due to some const. exptl. error or to 1 or more of 4 other possible factors, each of which is discussed by S. and C. Next, an examn. was made into the ionization of unexcited atomic I, using a new apparatus made of Pyrex glass mounted in an elec. heater so that its temp. could be raised to above 500° . Temps. were measured with a Pt resistance thermometer. While the elec. leak at high temps. was serious, it increased uniformly with voltage so that a good zero line could be detd. for each run by a series of measurements with the filament turned off. Measurements were made at pressures of 0.01 and of 0.032 mm. of Hg and with current values ranging from 3.7×10^{-9} to 38×10^{-9} amp. Two breaks occurred in the curve, at (b) 8.7 and (c) 10.16 v. The (b) break, however, is very much greater than in any of the runs on fluorescence, owing to the extensive formation of I atoms by thermal dissociation at the high temps. The av. of all values obtained in both sets of expts. is (b) 8.0 ± 0.1 v. and (c) 9.4 ± 0.1 v., giving a difference of 1.47 ± 0.045 v. The heat of dissociation of the I mol. is about 35,000 cal. per g.-mol. corresponding to 1.52 v. per mol. The natural inference from this close agreement is that ionization of the I mol. is accompanied by dissociation. This is predicted by Bohr's theory for H and has apparently been found by expt. by Mohler and Foote (*C. A.* 15, 335) and by Franck, Knipping, and Kruger (*C. A.* 14, 3581). The present investigation of fluorescing I may be thought of as a measurement of the degree of loosening of the electrons by light, and such loosening has been found to be given, at least approx., by the quantum relation. In this case the effect of light apparently is not the dissociation of some of the mols.—an explanation of photochem. action recently suggested by Nernst. Rather, the results are in accord with the view expressed by Perrin (*C. A.* 13, 3067), whereby quanta of radiant energy are emitted or absorbed in all chem. reactions.

A. L. FIELD

The physical properties of Röntgen rays. J. E. VERSCHAFFELT. *Chem. Weekblad* 16, 362-86(1919).—A general review of the subject of X-rays. V. first discusses the discovery of X-rays, their nature, and the laws governing the degree of their absorption by various substances. The characteristic X-rays for an element and their connection with absorption are explained, and interference phenomena are described. The interference of X-rays caused by the regularly oriented atoms in a crystal is taken advantage of in the methods used by v. Laue and by Bragg in detg. the structure of crystals. V. closes his review with a brief summary of the theory of X-rays and γ -rays.

L. H. ADAMS

The beta-ray emission from thin films of the elements exposed to Röntgen rays. LEWIS SIMONS. Univ. Cape Town. *Phil. Mag.* 41, 120-40(1921).—Following a review of the literature, the objects of the research are announced as (1) to det. whether the max. speed of an electron ejected from an atom is entirely independent of the nature of the atom and dependent only on the wave length of the incident radiation; (2) to det. the distribution of the speeds of the electrons emitted, aside from differences produced by emergence from deeper layers; (3) to det. the relation between each β -ray spectral line and the corresponding X-ray line. A description of the app. is given. The results for the ten elements examined show that it is improbable that the max. speed of the ejected electrons is independent of the substance. The expts. show that throughout the whole range of motion the distribution depends fundamentally upon the substance, but the difference if any in the max. velocities is too small to be demonstrated by the method used. Two possible formulas are presented for the electron speed de-

pending on which ring is the source of the electron and upon the K, L and M frequencies of the X-rays. There appears to be a type of electron emission for each type of X-ray, the energy of which is complementary to the wave emission, the "K" electron being the slowest on emergence, the "L" electron faster, and so on.

S. C. LIND

The absorption of gamma rays by magnetized iron. A. H. COMPTON. *Phys. Rev.* 17, 38-41(1921).—The recent expts. of C. and Rognley (C. A. 15, 462) have indicated that the ultimate magnetic particle responsible for ferromagnetism is probably the individual electron. If this is true, the electron may have the form of a ring such as that proposed by Parson in his "magneton" theory of at. structure. The present investigation has been carried out with the hope of detecting an effect due to the orientation by a magnetic field of anisotropic, magnetically polarized electrons. A ring electron should absorb more energy if its axis is parallel to a traversing beam of gamma rays than otherwise. Therefore, if by magnetization the axes of the ring electrons are turned so as to be more nearly parallel to the γ -rays, the part of the absorption due to the transfer of energy to such electrons would be increased. When the Fe was magnetized to satn. parallel with the transmitted beam of γ -rays, the observed increase in its absorption coeff. was $(0.004 \pm 0.019)\%$. For magnetization perpendicular to the γ -ray beam the absorption coeff. was increased by $(0.023 \pm 0.018)\%$. That is, for parallel magnetization the effect on the absorption coeff. is probably less than 1 part in 5,000 and for perpendicular magnetization it is probably less than 1 part in 3,000. While it is not possible to draw any definite conclusion from this expt. until more information is available with regard to the mechanism of γ -ray absorption, the evidence seems rather opposed to the hypothesis that a ring electron is the *ultimate magnetic particle*. In the present expts. the size of the beam of γ -rays was detd. by the holes in the magnet pole pieces, but a sufficient amt. of Ra emanation (about 75 millicuries) was used to obtain relatively intense ionization.

A. L. FRUO

The action of Röntgen and gamma radiations upon the electrical conductivity of selenium crystals. A. M. McMAHON. *Phys. Rev.* 16, 558-64(1920).—The measurements recorded were made upon a single Se crystal of the hexagonal variety obtained (by Tisdale) by distn. *in vacuo* at 185° . Its dimensions were roughly $3.2 \times 0.2 \times 0.1$ mm. Measurements were made in air at atm. pressure. The crystal was mounted between polished Pt electrodes, the direction of the rays being parallel to its long axis. The mech. pressure necessary was supplied by wts. When the crystal was acted upon by the total radiation from a Coolidge tube operating at 48.0 kv. and 3.5 amp. heating current, it was found that the change in cond. increased approx. 6-fold on increasing the pressure from 24 to 500 g., the relation between pressure and change in cond. being close to linear. The initial cond. at 24 g. pressure was in the neighborhood of 1.25×10^{-7} mhos., and at 320 g. pressure it was around 5×10^{-7} mhos. Two sets of excitation and recovery curves are given for the latter pressure, change in cond. being plotted vs. time in min. Measurements at 500 g. pressure, using in turn each of 5 of the principal lines in the L radiation of W, failed to disclose any effect. This is thought to be due to the low intensities afforded by the X-ray spectrometer. Other measurements, using the γ -rays from 1 mg. of Ra as an exciting agent, produced an unmistakable effect. Excitation and recovery curves are given for pressures on the crystal of 24, 216, and 320 g. It is calcd. that the ratio of change in cond. in mhos./sec. to absorbed energy in ergs/sec. when taken over a period of 1 min. in the case of γ -rays, X-rays, and light (0.7μ) and for a given intensity in each case of 2.60×10^{-2} ergs/sec. is, resp., 108.9×10^{-7} , 58.5×10^{-7} , and 33.2×10^{-7} . Although these figures are in the nature of approximations, their order of magnitude may prove suggestive of the possibilities in this line of work. Just what these differences may mean will be discussed after a more complete exptl. study has been made.

A. L. FRUO

X-ray spectroscopic investigations on cellulose. R. O. HERZOG AND WILLI JANCKE. *Z. Physik* 3, 196-8(1920).—There has been doubt among biologists as to whether the anisotropic structure of certain materials is due to the arrangement of the individual cells or to the structure of the mols. H. and J. show that cellulose has a definite crystal structure when examd. by the X-ray method developed by Hull and Debye and Scherrer. The cellulose has the same structure, which is rhombohedral, when obtained from different materials. F. C. HOYT

Crystal growth and chemical affinity. J. J. P. VALENTON. *Physik. Z.* 21, 606-9 (1920).—The assumption is made that atoms in undissociated mols. and in crystals possess residual electrostatic charges. Therefore, the atoms in the outer layer of a growing crystal exert an effect into the soln., attracting atoms of unlike sign and repelling those of like sign. The cube faces of NaCl have both + and — atoms arranged in checkerboard fashion. Midway between the atoms the field is neutral. The growth normal to these faces should be slow. The (111) faces represent an opposite extreme, for all atoms in any one net plane have the same kind of charge and there is no neutral field. Normals to these faces should be directions of rapid growth. Prominent crystal faces are those of slow growth; hence cubes are common for NaCl. Forms of high indices have their net planes so spaced that the electrostatic influence is exerted through several layers; therefore, there is rapid growth normal to such forms (cf. Niggli, *C. A.* 14, 3354).

OTTO VON SCHLICHTEN

Essentials of the minute structure of crystals. F. RINNE. *Physik. Z.* 21, 609-13 (1920).—*Leptonology* (λεπτός = fine, delicate) is the name proposed by R. to designate stereochemistry, stereophysics and crystal structure as a group. The units dealt with (atoms, ions, mols. and even electrons) are called *leptons*. Geometrical crystallography may be regarded as macro-stereochemistry, crystals being sections of the leptonic structure whose common faces are planes of high at. concn. and the edges between these planes lines of high at. concn. In a leptonic sense amorphous matter is no less regular than cryst., the latter merely representing 3-dimensional periodicity of space lattices, while the former may be compared with an excessively fine crystal powder. Transitions between individual leptons and crystals may be conceived of, such as atoms of very high electron content, or mols. of very high mol. wt. Leptonic structures may contain groups or clusters. These should be searched for and a means found to designate them, just as the chemist designates radicals in his chem. formulas. Mixed crystals are transitions between chem. compds. and physical mixts. and this conception may be extended to regular intergrowths of unlike cryst. substances. Morphotropism is produced by chem. substitution which may slightly change the mode of aggregation of the leptons. R. suggests that certain structure types (isotypes) combine to produce form groups irrespective of the chem. compn. Crystal growth and soln. is a matter of electrostatic attraction and repulsion between atoms in the outer layer of the crystal and the atoms in the soln. The leptonic structure of the crystal also plays a role in chem. decompn., as shown by the alterations of the micas and zeolites. O. v. S.

The electric dichroism of smokes and of diffraction gratings. SR. PROCOPIU. *Compt. rend.* 171, 1055-8(1920).—P. has shown that electric dichroism depends on the size of particles of smoke (*C. A.* 14, 3368) and now produces data to show that it is also a function of the diffraction of the particles and of their filiform arrangement under the influence of an electric field, showing that a diffraction grating gives the same kind of results. A. E. STARN

New method of instantaneous charges and its application to the problem of absolute retardation in the phenomenon of Kerr. M. PAUTHENIER. *Ann. phys.* 14, 239-306(1920).—When a beam of light passes through an elec. field in a liquid medium the velocity of propagation in the medium is changed. The portion of the beam vibrating parallel to the lines of force of the field is affected in the opposite sense to the

portion vibrating at right angles to the lines of force. This Kerr effect has been attributed to the orientation of the mols. in the liquid in some uniform manner due to the action of the field. From this hypothesis it has been deduced by Langevin (*Le radium* 1910, 249) that the retardation of the portion vibrating parallel to the lines of force should be twice as great as and of opposite sign to the retardation of the portion vibrating perpendicularly. Previous measurements have been largely in error due to the retardation effects of heating and electrostriction. Previous data have given no basis for explanation. P. has devised a method whereby the field is created and destroyed with such great rapidity as to make the above effects negligible. The ratio of the retardation parallel to the lines of force to that perpendicular has been found to be -2.00 ± 0.04 regardless of the wave length of monochromatic light used. Exact measurements were made upon the effect of electrostriction explaining the incompatible results of previous workers. The results are presented in support of the Langevin hypothesis of mol. orientation.

C. R. PARK

The aluminium spark discharge under water as a source of ultra-violet rays. WITOLD KASPEROWICZ. *Elektrochem. Z.* 27, 24-5 (1920).—The Al arc or spark spectrum under water is almost continuous. Details of K.'s app. are given. The ultra-violet rays from the Al arc were permitted to pass through various substances and the absorption spectra investigated. It was found that the absorption spectrum of C_6H_6 consists of seven bands; C_6H_6 dissolved in C_2H_5OH gave a number of band series; C_6H_6 vapor showed a number of band series in the extreme ultraviolet, about 150 bands all told, 40 of which have not been heretofore recorded. Lowering the temp. of the vapor or of the soln. did not cause a shifting of the bands; it seems as though bands below $270 \mu\mu$ are not very sensitive to temp. changes, indicating that the absorption takes place in the atom itself.

C. G. F.

The spectrum of bromine. I. Line and band spectra, lines of arc and spark types and the relations between the lines. MASAMICHI KIMURA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 127-38 (1920).—Spectra of bromine were obtained by sending a current from an induction coil between solid AgBr placed in glass cups in an evacuated tube. The lines in the emission spectra of the pink and blue glowing Br are tabulated and compared with the absorption spectrum. Const. frequency differences for numerous pairs of lines of the arc type were found. II. Line structure and the Zeeman effect. *Ibid* 4, 139-49.—More than 12 lines of the arc type in Br spectra were found to have complex structures. In strong magnetic fields the satellites of several complex lines developed into triplets. The Zeeman effect on a number of single lines was to produce magnetic triplets with wider specific separation.

F. O. A.

The distribution of charged ions in the path of an electric discharge through a tube containing bromine vapor. MASAMICHI KIMURA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 151-8 (1920).—According to Stark spectral lines of the spark type are produced by atoms charged doubly or triply while the arc lines are excited by atoms having lost a single electron. Spectroscopic study should show the relative distribution of ions in the discharge. Most of the lines that have been studied above were of the arc type, especially for larger cross-section area and larger pressures. When the tube was constricted more energy was absorbed at that point and more lines of the spark type were produced.

F. O. A.

Studies of the spectrum of chlorine. I. Emission and absorption spectra. MASAMICHI KIMURA AND MITSURU FUKUDA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 155-8 (1920); cf. preceding abstracts.—Emission spectra produced in tubes having electrodes made of NaCl, KCl and BiCl₃ were compared with the absorption spectra. The two are not complementary but the vapor emits light strongly in the region where most light is absorbed by the vapor. II. The influence of magnetic fields upon spectral lines of chlorine. *Ibid* 4, 159-61.—The Zeeman effect on single lines of the Cl

spectrum except λ 4786 produced magnetic triplets of wider specific separations than that of a normal triplet, but a simple relationship to the normal triplet was noted in each case.

F. O. A.

Unilateral conductivity of tubes having salt electrodes. MASAMICHI KIMURA AND JUNICHIRO NAGAHATA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 163-5(1920).—When enough NaCl (or KCl, etc.) is placed in a discharge tube just to cover one Pt wire electrode the current tends to pass in only one direction when the tube is evacuated. When the salt is cathode the current is apparently carried by the chloride ions. The neighborhood of this electrode becomes coated with blue metallic Na liberated during the discharge. An oscilloscope with falling plate camera showed rectification of high tension a. c.

F. O. A.

The arc and spark lines of iodine. MASAMICHI KIMURA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 167-8(1920).—The effect of constricting a part of the discharge circuit through I vapor is to enhance the spark lines and suppress the arc lines. On using condensers the position of max. intensity was shifted toward the shorter wave length side.

F. O. A.

Electrical states of iodine vapor when emitting line and band spectra. KOMATARO MAKINO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 169-71(1920).—A Geissler tube containing I was connected in series with a glow oscilloscope and a photograph was taken of the two simultaneously on a falling plate. When the current was strongest the spark lines predominated while a weaker current gave the broader bands of the arc discharge. The potential gradient was found to increase with the shift toward the sharp spark lines.

F. O. A.

The regularity of the Stark effect on the spectral lines of hydrogen and helium. USABURO YOSHIDA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 187-99(1920).—An empirical equation is given which fits fairly well the displacements of the components in the Stark effect for some of the Balmer lines as observed by Stark and for some He lines as observed by Takamine and Kokubu (*C. A.* 12, 2067, 2493). This equation contains a const. 0.673 which is similar to the const. 0.660 obtained theoretically by Epstein (*C. A.* 11, 749).

F. O. A.

The theory of Powell's bands and the group-velocity in dispersive media. Nihal KARAN SETHI. *Phys. Rev.* 16, 519-25(1920).—Powell's interference bands are observed when a hollow prism containing liquid is used to form a spectrum and a transparent plate with its edge parallel to the refracting edge of the prism is immersed inside the liquid so as to cover half the effective aperture of the beam passing through it. In the present expt. the cell containing the liquid was placed between the prism and the observing telescope of a spectrometer. The expt. was begun with CS_2 alone and very sharp and narrow bands were observed throughout the spectrum when a thin glass plate was immersed in the cell on the thicker side of the prism. As the refractive index of the liquid was lowered by the addition of C_6H_6 , the bands widened and a thicker plate (about 5 mm.) had to be used to keep them of convenient size. When the refractive indices of the plate and mixt. became more nearly equal, even the thickness of this plate proved to be less than the optimum. As it was not convenient to use thicker plates, the aperture of the beam was cut down. When the refractive indices for the red, yellow, green, blue and even violet were equalized in succession, very narrow apertures down to a 1 mm. slit had to be used to keep the bands at max. visibility. Although the refractive index of the liquid had now been reduced to a value lower than that for the plate almost throughout the visible spectrum, the bands remained as clear and distinct as ever with the plate still on the thicker side of the prism. On further reducing the refractive index of the liquid, the bands in the red became very broad, gradually decreased in visibility and finally disappeared. This was followed by the disappearance of the bands in the yellow and the green. At this stage, on placing

the plate on the other side, broad bands could be seen in the yellow and red regions, becoming narrower and more distinct toward the red side. By further addition of C_6H_6 , the point of zero visibility of the bands sepg. these 2 parts of the spectrum could be shifted further towards the violet end until finally the bands in the visible spectrum could be seen only with the plate on the thinner side of the prism. The correct condition then for the visibility of the bands is that so long as the group-velocity of light in the plate is less than in the liquid, the plate must be introduced on the thinner side of the prism; when it is greater, on the thicker side. The transition from one case to the other takes place when the group-velocities in the 2 media are equal. The side on which the plate should be placed is not detd., therefore, by the relation between the refractive indices of the plate and the liquid as stated by Mascart and Schuster. A study by the method of spectroscopic analysis of the laminar diffraction pattern produced by the plate while immersed in the liquid shows clearly that the group-velocities in the plate and liquid are identical at the point of zero visibility of Powell bands in the spectrum. Several photographs of the spectrum of the Fraunhofer diffraction pattern are shown, as well as several of the Fresnel pattern. Further, there is a definite quant. relation between the obliquity of the interference lines in these diffraction patterns and the degree of visibility of Powell's lines. The max. visibility corresponds to an inclination of 45° to the length of the spectrum. $\tan^{-1} 0$ and $\tan^{-1} 2$ correspond to zero visibility and mark the extreme limits between which they are visible. The *determ. of refractive indices and dispersive powers* for which Talbot's and Powell's bands have been used (cf. Doubt, *Phys. Rev.* 10, 332(1917)) could no doubt be made more conveniently by using the spectrum of laminary diffraction pattern, preferably of the Fraunhofer type. The oblique bands observed cut the spectrum exactly at the same points as the corresponding Talbot's or Powell's bands and they are generally easier to see. There is no question of having the optimum thickness of plate and no necessity to limit the aperture of the observing telescope.

A. L. FIELD

The effect of temperature upon the infra-red absorption of certain glasses. G. R. GRANTHAM. *Phys. Rev.* 16, 565-74(1920).—An investigation to study the effect of temp. upon the infra-red absorption spectra of the same specimens used by Gibson (C. A. 10, 1001) and to see whether the shift of the edge of an absorption band was coincident with a shift of a transmission band lying largely in the infra-red or resulted in a narrowing of such a transmission band. In addition, measurements were made on a specimen of Corning G. 585 blue glass of 1.98 mm. thickness. The 5 specimens were in turn placed in a furnace and the absorption spectra studied between 0.6 and 4.0μ for temps. of 80° , 307° and 440° . The core of the furnace was an Fe cylinder, 12 cm. long and 8 cm. diam., through the axis of which a hole 2.5 cm. in diam. was bored. The specimen was cemented to an Fe slide which fitted snugly into a slotted sleeve located at the middle point of the Fe core. The heating element was a coil of Fe wire wound around the cylinder over asbestos paper soaked in water-glass. The source of radiation was a 400-w. N-filled W lamp, which was placed against the end of the furnace and under conditions of thermal equil. gave a temp. of 80° at the specimen, with no current in the heating coil. A Hilger infra-red const. deviation spectrometer equipped with a Coblentz Bi-Ag thermopile was used. Temps. were measured by a Cu-constantan thermocouple, the junction of which was in contact with the specimen. A Coblentz astatic galvanometer was used, the sensibility obtained being about 3.3×10^{-11} amp. per mm. at 3 m. distance. For measurements between 2.0 and 4.0μ , the correction due to the radiation from the furnace and specimen had to be detd. The red glass (Zn, colored with Cd-Se) showed a decrease in absorption with temp. rise over the whole range except for wave lengths less than 0.75μ , when the absorption increases with temp. rise. There is evidence of a shift of the whole transmission band toward the less refrangible portion of the spectrum. For the orange-colored glass (non-Pb, colored

with Cd-Se), there is indication of a slight shift with temp. rise of the transmission band extending over about the same region, 0.7 to 2.7 μ , as the transmission band of the red glass. There is a very slight increase in transmission throughout this band. At the 3.3 μ absorption band there is a marked increase in transmittance with temp. rise. The yellow-amber glass (borosilicate, colored with Cd-Se) showed a shift of the whole transmission band toward the longer wave lengths with temp. rise and slight decrease in transmittance except in the region of absorption bands, when the transmittance increases. The lemon-yellow glass (Zn, colored with Cd-Se) shows at high temps. a decrease of transmittance throughout the range from about 0.6 to 2.4 μ . In the case of the blue glass, having sharp absorption bands, a temp. increase produces a decrease in absorption in the region of absorption bands in the infra-red. The peaks of the transmission bands are shifted toward the longer wave lengths at higher temps. This is caused by an increased absorption on the long wave length side of an absorption band and a decreased absorption on the short side. Consequently the absorption band is broadened without any apparent shift in the peak. This applies particularly well to the band having a max. between 1.3 and 1.8 μ . Ascending and descending temps. give the same results in all cases. In general, temp. rise decreases slightly the absorption in the region of an absorption band and causes a shift of the transmission bands toward the longer wave lengths, the shift being greater on the more refrangible edge.

A. L. FIELD

The luminescence of samarium. HORACE L. HOWES. *Phys. Rev.* 17, 60-3 (1921).—The Sa_2O_3 was weighed and dissolved in HCl and dild. to 1/100. This soln. was added to pure CaCO_3 , which had been previously tested for non-luminescence, in a proportion which gave 1 atom of rare earth to 125 atoms of Ca. The mixt. was evapd. to dryness with stirring. The luminescent spectrum of Sa_2O_3 in CaO , obtained by excitation with cathode rays, was then studied after various heat treatments had been given to the fresh preps. Limited portions were placed in uncovered glazed crucibles and heated at several temps. between 200° and 1200° in an elec. resistance furnace. The duration of heat treatment at one temp. was also varied between 1 and 3 hrs. It was found necessary to heat to a critical temp. of approx. 600° to render the luminescence sufficiently bright for spectrum analysis, when the specimen was subsequently cooled to 20°. The 200° specimens gave no luminescence at all and the 400° specimens exhibited but few regions of luminescence. Variation in the duration of heat treatment within the limits given above had no effect. One specimen was heated 5 min. in the core of an arc carbon. Specimens previously heated to 1200° or above that temp. were the most brilliant under cathode rays at 20°, although no quant. measurements of intensity were made. The luminescence spectrum consists of bands of varying intensities, which plotted to a frequency scale can be resolved into 9 series of const. frequency intervals. The intervals, though const. for a given series, vary slightly from 1 series to another. A table is given showing the wave length and reciprocal of wave length of each band together with the relative intensity and series letter. The total no. of bands observed was 32, of which 13 had not been previously recorded. No shift in the position of the bands could be measured, whether the specimen was heat-treated at 600° or 3000°. This remarkable stability is not generally associated with a luminescent substance. The minimum temp. for the thermo-luminescence of Sa_2O_3 in CaO was found to be about 200°.

A. L. FIELD

The photochemical decomposition of nitrogen peroxide (DANIELS, JOHNSTON) 2. Alternating-current carbon arc (DUFFIELD, WALLER) 4. Photo-elasticity for engineers (COKER) 13.

Röntgen tubes. SIEMENS & HALSKE, AKT.-GES. Ger. 325,941, Jan. 4, 1918.

The Röntgen tubes are provided with an anticathode of a W or Mo body with a mirror of Pt, Ir or an alloy of the two metals.

Producing very hard Röntgen rays. J. E. LILIENFELD. Ger. 309,232, Mar. 23, 1918. A light at. anticathode mirror, e. g., of Mo, is employed, with tensions of more than 175,000 v.

Illuminating with Röntgen rays. E. POHL. Ger. 326,984, Feb. 11, 1914. The tubes are immersed in a filtering and cooling liquid and placed in a suitable container upon the body under treatment.

Facilitating chemical reactions by radiations. E. STATINEANU. Brit. 154,213, Nov. 22, 1920. The reaction between a gas and another substance is facilitated by subjecting the gas to the action of ultraviolet, Lenard, Becquerel, or Röntgen rays and then bringing it into contact with a metallic surface, or by directing the gas on to a metallic surface which is itself subjected to the action of ultraviolet or other rays. By subjection to the action of these rays, the gas is stated to emit cathode rays whose vibrations are amplified by contact with a metallic surface. Suitable app. are specified.

Protective material opaque to X-rays. P. A. M. J. ANGEBAUD. U. S. 1,368,094, Feb. 8. A protective device opaque to X-rays and similar radiations from radioactive substances is formed of veneer, muslin or other sheet material in layers held together with Na or K silicate.

4—ELECTROCHEMISTRY

COLIN G. FINK

World's largest electric steel furnaces operating. ANON. *Iron Age* 107, 442 (1921).—The largest elec. steel furnaces in the world, at the United States Naval Ordnance plant, are two 40-ton Heroult's; they refine the steel as it comes from the open-hearth department, which has two 75-ton basic open-hearth furnaces. C. G. F.

High-speed cast-steel tools from the electric furnace. S. H. BUNNELL. *Iron Age* 106, 1258(1920).—Cast cutter blanks are now being produced in one plant with less than 10% loss from defective castings. Users find them much better in uniformity, hardness, and cutting qualities, than the forged tools. A Rennerfelt furnace is used, and all raw material carefully weighed before charging, and the greatest care is taken to insure uniformity in the process, which is lab.-controlled throughout. A distinctive micrographic structure of great uniformity is obtained. At present this plant at Green Island, has a capacity of 7 tons of alloys per day. W. E. RUDER

Electric blooming mill in Delaware. ANON. *Iron Age* 106, 1733(1920).—Located at New Castle, Del. a few miles south of Wilmington, this plant has a capacity of six 30-ton open-hearth furnaces, four basic, and two acid bottoms. Both 17½-inch and 21-inch ingots are cast in inverted molds with sink heads. Rolling capacity is limited to a 34-in. two-high reversing blooming mill, motor-driven. All sizes of blooms, billets and slabs up to 18 in. X 8 ft. are produced. W. E. RUDER

Note upon the alternating-current carbon arc. W. G. DUFFIELD and MARY D. WALLER. Univ. Coll., Reading. *Phil. Mag.* 40, 781-5(1920).—In a former paper (C. A. 10, 857) D. investigated the C loss from the poles of the d. c. arc. The study is now extended to the a. c. arc. The results are those to be expected from the d. c. data. The loss per coulomb increases rapidly as the distance between the poles increases and reaches a steady state at about 6 mm. Hissing appears to be associated with access of air to the arc and hence with high C consumption. S. C. LIND

Rise and development of the electrolytic alkali and chlorine industry of Europe. JOHN B. C. KERSHAW. *Chem. Met. Eng.* 24, 77-82, 119-22, 167-70(1921).—See C. A. 14, 3399. E. H.

An indicator for water level in storage batteries. ANON. *Elec. Rev.* 78, 235-6 (1921).—A small bathometer indicating the level of the electrolyte in a storage battery is described. The "water" scale is connected by flexible wires to Pb electrodes built in regular filler caps. The electrodes extend nearly to the top of the plates so that when the circuit is broken and the needle swings to "low," there is still 24 hrs. before trouble will start. The instrument is mounted on the dash of the automobile and replaces the ammeter, or the charge and discharge indicator. W. H. BOYNTON

Nickel plating on aluminium. A. MAZUIR. *Ann. chim. anal. chim. appl.* 2, 335-6 (1920).—Immerse the Al for 2 min. in a bath containing 8 g. Na_2O and 30 g. KCN per l., wash thoroughly with H_2O , and scrub vigorously with $\text{Ca}(\text{OH})_2$ soln. (4 parts H_2O for 1 of $\text{Ca}(\text{OH})_2$). Wash and scrub with H_2O , and immerse 2-3 min. in a bath of 350 cc. HCl (22° B $\acute{\text{e}}$.) + 2 g. MnCl_2 + 650 cc. H_2O (a bath containing 3 g. FeCl_2 is less satisfactory), wash with H_2O and transfer to the Ni bath (120 g. NiSO_4 + 50 g. $\text{NiSO}_4(\text{NH}_4)_2\text{SO}_4$), which should have a d. of 12-13° B $\acute{\text{e}}$. and be neutral. The anodes are Ni. Electrolyze 1.5 hrs. at 2.5 to 3 v. and 1 to 1.5 amp. per sq. dm. Wash with boiling H_2O and dry by compressed air. F. W. SMYTHOR

Black nickel solutions. I. J. HAAS, JR. *Metal Ind.* 19, 23-5 (1921).—H. discusses the theories of black Ni deposits and concludes that they may consist of NiS , $\text{Ni}(\text{OH})_2$, or a combination of the two. A Zn salt is necessary, and an alkali salt desirable in the production of the black Ni deposit. Slight acidity or alkalinity has no effect. A soln. giving a good black deposit without the use of thiocyanate consists of: water 1 gal. (3.785 l.), double Ni salts 12 oz. (341 g.), Rochelle salt $\frac{1}{2}$ oz. (14.2 g.), ZnSO_4 $\frac{1}{2}$ oz. (14.2 g.), Na_2SO_4 2 oz. (57.7 g.). W. H. BOYNTON

Electroplating generator with link belt drive. ANON. *Elec. Rev.* 78, 323 (1921).—An improved 5000-ampere, 6-volt separately excited d. c. generator running at a speed of 360 r. p. m. is described. The generator is driven by a 50-h. p. motor by means of a link belt running in oil. Details and illustrations are given. C. G. F.

Troubles prevented in electric precipitation plant (Cottrell precipitator). R. H. N. LOCKYER. *Elec. World* 77, 493 (1921).—Trouble in motor-generator sets due to puncturing of the armature insulation by high potential, was traced to oscillations set up in the high-potential line by the mechanical rectifier and by the arcing between the discharge electrode and the collecting electrode. These oscillations are transmitted to the generator and set up a peak voltage much higher than the normal. The static potential is at times also very high, reaching 20,000 v. To prevent great oscillations a relay is placed in the generator armature circuit. This relay normally short-circuits a heavy grid resistance but reacts during surges. A resistance in series with the low-tension side of the transformer greatly aids in obtaining smoother rectification. Static troubles are overcome by connecting two condensers across the generator armature leads. These are connected in series with the middle point grounded. To prevent grounds in the motor windings choke coils are inserted in the motor leads together with a 3-phase knob lightning arrester with horn gaps and graphite resistance in series with each leg or phase. A special door switch connected to a no-voltage release coil is used for protection of the operator. Wiring diagrams are given. W. E. RUDEK

Two laboratory applications of the triode valve. J. SCOTT-TAGGART. *Electrician* 86, 124 (1921).—Methods have been devised whereby this valve may be used to measure high voltage accurately and easily and to test condensers and other app. for high insulation. For measuring high voltages the valve is connected across the points with a milliammeter or galvanometer in series. The grid is now adjusted to a negative potential which just prevents the passage of current through the valve, which acts as a voltmeter of infinite resistance. When a sliding contact on the potentiometer resistance, placed between the grid and the filament side of the valve, brings the current to zero, the voltage across these points is directly proportional to the voltage desired.

The value read need only be multiplied by a predetd. const., which will be rather less than the v. amplification factor of the valve. For testing high insulation, a milliammeter and an anode battery are connected in the plate circuit. The grid circuit also contains a battery (up to 50 v.) with its positive connected to the filament, and the material to be tested. With the grid circuit open the current value in the plate circuit is first read, then after an interval, the grid circuit having been closed, it is read again. If the readings are the same the insulation may be considered infinite. The slightest faultiness of insulation is indicated by a decrease in the plate current. This arrangement distinguishes between infinite resistance and one of exceeding high value; the negative potential communicated through the resistance to the grid causes the decrease in the anode current. This was used as a means for detg. very closely the temp. at which glass begins to act as a conductor. Diagrams of the connections are given.

W. E. RUDER

Determining iron loss of sheet samples. THOMAS SPOONER. *Elec. World* 77, 91(1921).—A substitution method is described which is of sufficient accuracy for rebuilding and repair work on app. in industrial plants or central stations. This method gives sine-wave losses from any com. 60-cycle a. c. supply and requires no special app. except two simple regulating auto-transformers. Two scales on the wattmeter allow of testing 5-kg. samples to save material. After a use of over 3 yrs. the accuracy has been found to be entirely satisfactory for commercial purposes. Max. error in this period was +3%, algebraic mean +0.25% on 32 check samples. A diagram of connections is given.

W. E. RUDER

Observations on the zinc electrode (MOORE) 2. Industry's supply of energy (SMITH) 13. Electrostatic deposition of dust from blast-furnace gas (BURY, *et al.*) 21. Modifying starch (U. S. pat. 1,366,653) 28. Viscose (Brit. pat. 153,444) 23.

Storage batteries. B. FORD. U. S. 1,367,593-4-5, Feb. 9. Structural features.

Storage battery. J. M. ALLEN. U. S. 1,368,093, Feb. 8. Structural features relating to rubber plates.

Storage battery plates. A. J. TRIGWELL. U. S. 1,367,287-8, Feb. 1. Structural features.

Separators for storage batteries. D. P. BATTERY CO. and J. WADDILL. Brit. 154,083, Dec. 13, 1919. Separators for storage cells are formed of glass felt which is made by superposing several layers of glass wool one upon another and cementing them together by gelatin, Na silicate or other suitable substance. The glass felt is used in conjunction with a porous diaphragm of wood, wood cellulose, perforated ebonite or celluloid, the glass felt being placed against the positive electrode and the porous diaphragm against the negative.

Depolarizer for galvanic elements. B. HARTE. Ger. 319,222, May 25, 1916. Calomel, in finest powder, is firmly incorporated under pressure with the MnO₂-graphite mixt., in an amt. equal to 1% by wt. of the graphite.

Electrode for electrolytic cells. C. J. ROTTMANN. U. S. 1,367,097, Feb. 1. The pat. relates to structural features of electrodes for electrolytic condensers, lightning arresters, rectifiers or similar devices.

Battery electrodes. H. N. COX. U. S. 1,366,559, Jan. 25. An electrode for primary batteries is formed of a mixt. of Cu oxide 100 parts with 2 parts of NH₄Cl or NaOH with or without 2% of finely divided Fe.

Calcining coke for electrodes. W. HOOPES. U. S. 1,366,457-8, Jan. 25. Raw coke is supplied to the top of a vertical column of uniform cross-section and calcined coke is withdrawn from the bottom. An elec. current is passed through an intermediate portion of the column and at the same time a current of an inert gas is forced through

the entire column uniformly to cool the calcined coke in the lower portion of the column and to distribute the heat in the intermediate section and preheat the coke in the upper portion of the column.

Incandescent cathode for high-vacuum cathode tubes. GKS. FÜR DRANTLOSSE TELEGRAPHIE. M. B. H. Ger. 325,002, Dec. 13, 1917. The cathode is made of W; by charging its surface with H the sp. electron emission is increased over the characteristic value of pure W.

Negative electrodes for storage batteries. A. POUCHAIN. U. S. 1,366,489, Jan. 25. A negative electrode is prepd. by placing a core of conducting material such as Cu-coated retort C in a bath containing salts of Zn, Hg and Mg, and passing an elec. current through the bath with the core as cathode. U. S., 1,366,490 relates to a negative electrode for storage batteries comprizing a solid Zn plate and metallic pieces such as Ag extending along the sides of both surfaces of the plate to provide a material of high cond. unattacked by the electrolyte when the circuit is closed. U. S. 1,366,491 relates to negative plates of rigid supporting material such as celluloid which is not attacked by the electrolyte, with 2 plates of Zn each adhering to a face of the supporting plate.

Bipolar electrode for gas-producing electrolytic cells. A. J. MACDOUGALL. U. S. 1,366,404, Jan. 25.

Anode for electroplating cells. J. A. HALL. U. S. 1,366,534, Jan. 25. Structural features.

Recovering tin; electrolysis. M. A. ADAM, J. STEVENSON and A. T. MABBITT. Brit. 154,242, Feb. 27, 1919. Sn is dissolved from tinned scrap, etc., by a strong soln. of Sn and Fe chlorides, preferably containing a small proportion of HCl. A suitable soln. is made by treating a 25% soln. of FeCl₂ with 1% of HCl and with metallic Sn until it contains 6.5% of SnCl₂ and 1.5% of SnCl₄. This soln., after use for dissolving Sn from scrap, is electrolyzed to deposit a small amt. of Sn, equal to that dissolved from the scrap, for instance 0.2 % of the soln., the current density and rate of flow and speed of the cathode being regulated to attain this end, and to deposit non-adherent Sn, which is scraped off the rotary cathode. A suitable construction is specified.

Electrodeposition of copper. S. O. COWPER-COLKS. Brit. 154,373, Sept. 11, 1919. Elastic or tempered Cu is produced by deposition from a sulfate soln. on a cathode rotating at a peripheral speed of not less than 1000 ft. per min. Hardness may be increased by the use of higher speeds, or by addition of say 0.1% of an org. substance such as glue or gelatin, or of As, preferably to the amt. of $\frac{1}{10}$ oz. to 1 gal. of 12% CuSO₄ soln. containing free H₂SO₄. The As may be added in the form of oxide dissolved in 10% NaOH soln.

Electrodeposition of nickel. C. HEBERLEIN. Brit. 154,471, Aug. 8, 1919. In a cyclic process, Ni is dissolved from ore, mat, or the like to form a soln. having an optimum acidity for deposition, i. e., a % of free acid between 0.1 and 0.4. The soln. is passed in series through the cathode compartments of a number of vats, while a Ni salt soln. is passed in series through the anode compartments, the diminution of acidity of the catholyte through electrolysis being compensated for by partial transfusion of the anolyte, which increases in acidity in successive vats. When the acidity of the anolyte has become incompatible with the maintenance of the catholyte acidity below 0.4%, the anolyte is withdrawn and, without concn., is used for prepg. fresh soln. to be added to the circulating catholyte. The anolyte may be replenished from the fresh soln. or from the catholyte. Each vat preferably contains a number of alternating cathode compartments and insol. anodes within a single anode compartment, as described in 141,766 (C. A. 14, 2448), electrolyte being fed in parallel through the cathode compartments of each vat but in series through those of different vats. Diaphragms of clay, wood, or paper, or of framed millboard which may be treated with water glass, are

suitable. The catholyte may be at a higher level than the anolyte, so as partly to percolate through the diaphragms. The current density may be 10 amp. per sq. ft.

Electrodeposition of iron. S. O. COWPER-COLLES. Brit. 154,282, Aug. 6, 1919. Worn parts of machines, such as crank shafts, connecting rods, axle casings, and cylinders, are repaired, and undersized parts are built up, by the electrodeposition of Fe. Parts not to receive the deposit are either protected by rubber pads or by wax or other stopping-off material, or sulfurized or oxidized and sepd. from the worn part by a V-section groove so that the deposit not required can be removed. The parts to be built up are cleaned by acid or a sand-blast and may also be preliminarily connected as anodes in the depositing-vat. The sol. anode may be of smaller area than the surface to be coated, to ensure even distribution of the deposit. During the deposition, the electrodes may be moved relatively to one another at intervals or continuously. A suitable electrolyte is a soln. of FeSO_4 nearly satd. at ordinary temps. In use, it is maintained near its b. p., and is passed over scrap Fe or steel in a regenerating tank. In the depositing-vat, the electrolyte is rapidly deflected on to the articles by wooden or other baffles. The deposit may be regulated to the required thickness, or may be ground to gage afterwards. It may be annealed, converted into steel by cementation, and hardened by quenching or case hardening, or may be utilized without such treatment. Cf. 11,393, 1889, 15,523, 1900, 28,746, 1910, 16,565, 1913 (C. A. 9, 30), 8795, 1914, and 116,509.

Ferrous oxide. A. J. MACDOUGALL. U. S. 1,367,409, Feb. 1. Fe within an electrolytic cell is subjected to the action of the acid products of electrolysis of an aq. soln. of NaCl and the resulting Fe salt is converted into ferrous oxide by the action of the alk. products of the same electrolysis.

Electrolytic production of copper and zinc alloys. S. O. COWPER-COLLES. Brit. 154,108, Feb. 24, 1920. Alloys of Cu and Zn are deposited from an electrolyte which contains a salt or compd. of one of the metals, is continuously replenished with a compd. of the other metal, and is rapidly circulated or agitated by means of propellers. The condition of the electrolyte may be tested by means of a thin metallic ribbon which passes continuously through the electrolyte and is wound up so that the color of the deposit can be observed. A suitable electrolyte contains a Cu salt, Cu anodes being used and a Zn compd. added, preferably near the propeller or propellers. For the protection of Fe and steel an alloy containing say 50% of Zn may be deposited from an alk. electrolyte, such as the double cyanide of Cu and K; Zn compds. are added continuously or at short intervals, or a small Zn electrode may be used. If the Zn salt is in soln., it may be fed in by means of a siphon or tank with a regulating valve. Dry salt may be fed in by a mechanical device such as small buckets.

Electric purification of gases containing dust. H. PÜNING. Ger. 318,772, Feb. 11, 1919. The velocity of the current of gas is increased periodically to such a degree that the particles of dust adhering to the electrodes are entrained by the gas, leaving the electrodes clean.

Nitrates from nitrogen fixation. C. H. BUETTNER. U. S. 1,368,019, Feb. 8. N and O are brought into contact with H_2O in small quantities and are then subjected to the action of an elec. arc in order to produce a strong pure nitrate soln. $\text{Ca}(\text{OH})_2$ may be used in the H_2O to obtain $\text{Ca}(\text{NO}_3)_2$.

Electrolytic cell adapted for producing chlorine and caustic soda from salt solutions. H. I. ALLEN. U. S. 1,368,010, Feb. 8. Structural features.

Electrolytic cell adapted for decomposing brine. H. I. ALLEN. U. S. 1,368,011, Feb. 8. Structural features.

Electrolytic cell for generating oxygen and hydrogen. J. B. BURDETT. U. S. 1,368,206, Feb. 8. The cell is of large capacity and comprizes an electrode having

vertical plates spaced apart, a conductor leading to the top and an intervening block of substantially the same current-carrying capacity as the electrode.

Electric arc furnace for treating gases. B. THOMAS. U. S. 1,367,842, Feb. 8. The furnace is adapted for fixation of atmospheric N. It has a centrally placed air inlet at one end and an annular air discharge opening at the other end, electrodes entering through the air inlet, extending outwardly as a loop and returning to and passing out through the air inlet, and another electrode at the opposite end. Cf. C. A. 15, 348.

Electric furnace adapted for melting brass or other metals. A. M. ERICHSEN. U. S. 1,367,364, Feb. 1.

Electric furnace adapted for heating metals. O. A. COLBY. U. S. 1,367,124, Feb. 1.

Electric incandescent lamps. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOH-LAMPENFABRIEKEN. Brit. 154,190, Nov. 17, 1920. Deleterious gases such as H_2O vapor are removed from lamps of the exhausted or gas-filled types by introducing substances which form drying agents on heating, the heating being effected after the lamps are sealed. A suitable compd. is P suboxide, P_2O , which at 350° is decomposed into P and P_2O_5 .

Electroplating apparatus. H. A. SEDGWICK and P. J. SHEEHAN. U. S. 1,367,567, Feb. 8.

6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Hexabasic polymolybdates. S. POSTERNAK. *Compt. rend.* 171, 1213–5 (1920); cf. C. A. 15, 810.—Of the 3 hexabasic heptamolybdates previously described, the K salt is least stable; its aq. solns. deposit spontaneously fine soft needles of formula $\text{K}_2\text{O} \cdot 3\text{MoO}_3 \cdot 3\text{H}_2\text{O}$, or a multiple. The corresponding NH_4 salt, not previously described, can be isolated from the products of decompn. of ordinary NH_4 molybdate by water at 150° . P. assigns to these isomorphous salts the formula $(\text{RO})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_3 \cdot \text{O} \cdot \text{MoO}(\text{OR})_2 \cdot 6\text{H}_2\text{O}$. The Na salt ($22 \text{ H}_2\text{O}$) is much more stable and can be recrystd. Addition of 1.5–2 mols. of HCl, or, satn. hot with MoO_3 , transforms it to the trimolybdate, usually written $\text{Na}_2\text{O} \cdot 3\text{MoO}_3 \cdot 7\text{H}_2\text{O}$, but from which the last mol. of water is removed only by calcination and which is to be formulated $(\text{NaO})_2 \cdot \text{HO} \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_3 \cdot \text{OH} \cdot 6\text{H}_2\text{O}$. Addition of increasing quantities of HCl to satd. solns. of the hexammonium heptamolybdate forms condensed hexabasic polymolybdates of the general formula $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_m \cdot \text{O} \cdot \text{MoO}(\text{OHNH}_4)_3 \cdot n\text{H}_2\text{O}$ in which $m > 5$, and analogous unsatd. compds. The following were prepd.: *hexammonium nonamolybdate*, $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_9 \cdot \text{O} \cdot \text{MoO}(\text{ONH}_4)_3 \cdot 7\text{H}_2\text{O}$, rhombic plates, little sol. cold, sol. hot, recrystd. without change; *hexammonium undecamolybdate*, $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_{11} \cdot \text{O} \cdot \text{MoO}(\text{ONH}_4)_3 \cdot 8\text{H}_2\text{O}$, prismatic needles, soly. like preceding; *hexammonium dodecamolybdate*, $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_{12} \cdot \text{O} \cdot \text{MoO}(\text{ONH}_4)_3 \cdot 8\text{H}_2\text{O}$, large, triclinic crystals; *hydroxypentammonium tridecamolybdate*, $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_{13} \cdot \text{O} \cdot \text{MoO}(\text{ONH}_4)_2 \cdot \text{OH} \cdot 14\text{H}_2\text{O}$, long needles which decomp. on recrystn. into hexammonium dodecamolybdate and *dihydroxytetrammonium tridecamolybdate*, $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_{13} \cdot \text{O} \cdot \text{MoO}(\text{ONH}_4)_2 \cdot (\text{OH})_2 \cdot 18\text{H}_2\text{O}$, microscopically well defined hexagonal prisms with base strongly inclined and pyramidal summit; *trihydroxytriammonium tridecamolybdate*, $(\text{NH}_4\text{O})_3 \cdot \text{MoO}(\text{O} \cdot \text{MoO}_2)_{13} \cdot \text{O} \cdot \text{MoO}(\text{OH})_3 \cdot 19\text{H}_2\text{O}$, needles, little sol. cold, nearly insol. in presence of NH_4NO_3 , sol. hot, lose cryst. water 100 – 135° and water of constitution at 160° . The nona- and dodecamolybdates can also be prepd. by soln. of 2–4 mols. MoO_3 in a soln. of ordinary $(\text{NH}_4)_2\text{MoO}_4$, the former at 30 – 40° , the latter at 100° . P. concludes that the

tridecamolybdate is the normal form of molybdic acid in an acid medium; alkali, especially NH_3 , hinders the condensation becoming complete; in this case hexabasic salts are formed with, usually, odd numbers of MoO_3 linked in the mol. Acid salts form only at the limit of condensation and are unsatd. salts of hexabasic tridecamolybdic acid. Alkali transforms all polymolybdates to orthomolybdates and conversely; addn. of acid to the latter forms heptamolybdates, or in case of NH_3 salts more condensed compds. The orthomolybdates should be considered as hexabasic trimolybdates, $(\text{RO})_3\text{MoO}_3\cdot\text{O}\cdot\text{MoO}_3\cdot\text{O}\cdot\text{MoO}(\text{OR})_3\cdot n\text{H}_2\text{O}$, and the first term of the entire series. NH_3 orthomolybdate loses nearly 0.5 of its NH_3 at ordinary temp. and exactly 0.75 at 160° in marked contrast to its supposed analog $(\text{NH}_4)_2\text{SO}_4$. The stability of the hexammonium salts diminishes with the number of linked MoO_3 groups which they contain; the dodecamolybdate can be heated to 170° without decompn.; the nonamolybdate begins to lose NH_3 at 130° and the heptamolybdate a little below 100° . Dried at 170° all hexammonium polymolybdates, including the orthomolybdates are changed uniformly to $(\text{NH}_4)_3\text{O}\cdot 6\text{MoO}_3\cdot\text{OH}$.

A. R. MIDDLETON

Corrosion of iron in sulfuric acid. Effect of chromium compounds. GEO. W. HEISE AND AMANDO CLEMENTE. *Philippine J. Sci.* 16, 439-46 (1920).—Expts. are reported in 0.5, 1.0 and 2.0 *N* acid; with increasing concns. of $\text{K}_2\text{Cr}_2\text{O}_7$ corrosion first increased and then decreased in the first two; in the last it rose to a max. but then showed no decrease. The Fe became passive when the dichromate concn. was above 19 g./l. in 0.5 *N* acid and 50 g./l. in 1.0 *N* acid; in 2.0 *N* acid a passive state was not reached. The data indicate that below the concn. which effects max. corrosion, the amt. of corrosion is proportional to concn. of dichromate. The marked inhibition of corrosion by chromic salts reported by Watts (*C. A.* 6, 2384) could not be confirmed with the Fe used, which was 99.8% and contained a very small amt. of Cu.

A. R. M.

Subiodide of tellurium, TeI_2 . A. DAMIENS. *Compt. rend.* 171, 1140-3 (1920).—The data obtained by a thermal study of the system Te-I_2 are submitted. Heats were made in an inert gas and constant stirring was maintained throughout the cooling period. From the cooling curve, confirmed by the curve of duration of crystn. and thermic and metallographic analyses, it is concluded that TeI_2 has no existence as a definite compd. but consists of a eutectic mixt. of TeI_4 and a solid soln. of Te in TeI_4 .

A. R. M.

Complex compound of thallium and hydrofluoric acid. BARLOT. *Compt. rend.* 171, 1143-5 (1920).—Metallic Tl, displaced from the acetate by pure Zn, was dissolved in dil. H_2F_2 , the product evapd. to dryness on a sand bath and taken up with water. On evapn. *in vacuo* brilliant, white elongated prisms were formed. The salt melts easily with evolution of H_2F_2 and dissolves in cold water yielding a soln. acid to indicators but not attacking glass. Analysis indicated the compn. $\text{TlF}_2\cdot 2\text{HF}$. Ca salts ppt. no F either from the hot or cold solns. even after several days, which suggests the constitution $\text{H}_2[\text{TlF}_4]$. A study of the curve of neutralization confirmed the bi-basidity of the acid. The coeff. of sp. magnetization was about 50% higher than that calcd. from the elements.

A. R. MIDDLETON

Reduction of permanganate by arsenious acid. MAX GELOSO. *Compt. rend.* 171, 1145-8 (1920).—The formation in H_2SO_4 soln. of a green soln. which quickly clouds with formation of a red-brown ppt. has been ascribed by Deiss (*C. A.* 5, 847) and by Travers (*C. A.* 11, 2866) to formation of an oxide intermediate between MnO and MnO_2 . G. here shows that production of the green color corresponds exactly to formation of Mn_2O_3 or $2\text{MnO}_2\cdot\text{MnO}$. The green color is not formed unless the concn. of H_2SO_4 is within certain limits. HNO_3 and H_3PO_4 can replace H_2SO_4 . Presence of a large amt. of As_2O_3 displaces the end-point. Presence of sulfates of Zn, Ni, Al, Mg and K was without effect. Sulfates of Mn and of Ag both reduced the As_2O_3 required. Formation of a double salt partly manganous and partly a green unstable compd. in which MnO_2 functions as a base is suggested.

A. R. MIDDLETON

Separation of gallium from indium and zinc by fractional crystallization of the cesium-gallium alumin. P. E. BROWNING AND L. E. PORTER. *J. Am. Chem. Soc.* 43, 128(1921).—7.5 g. of mixed hydroxides containing 26.5 pts. Ga_2O_3 to 73.5 pts. In_2O_3 were used; the first crystals of alum showed $\text{Ga}_2\text{O}_3/\text{In}_2\text{O}_3$ 85.1:14.9. After 5 fractions had been obtained the last crystals in each flask showed $\text{Ga}_2\text{O}_3/\text{In}_2\text{O}_3$: (1) 100.0:1; (2) 95.3:4.7; (3) 84.3:35.7; (4) 23.4:76.6; (5) 1.9:98.1; (6) (mother liquor), 0.6:99.4. In the sepn. of Ga from Zn, two crystals gave an alum free from Zn. A. R. M.

Some properties of selenium oxychloride. VICTOR LENHERR. *J. Am. Chem. Soc.* 43, 29-35(1921); cf. *C. A.* 15, 480.— SeOCl_2 as ordinarily prepd. is slightly yellow but when purified by distn. under reduced pressure and recrystn. by freezing gives a nearly colorless product, b_{728} 176.4°, m 8.5°, n_{20} 1.6516, sp. cond., with C electrodes, 9.6×10^{-4} at 28°. It is a practically perfect screen for wave lengths below 4050. A very large no. of chem. properties are recorded under the headings: action on (a) metals, (b) nonmetals, (c) oxides, (d) carbonates, (e) sulfides, (f) peptizing action on BaSO_4 , (g) oxidizing agents, (h) hydrocarbons, (i) carbohydrates and proteins, (j) vegetable and fish oils, (k) rubber, gums, resins, etc., (l) coals and carbons, (m) C from iron and steel. No physiol. action was noted aside from that of the HCl produced by its hydrolysis.

A. R. MIDDLETON

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

To the memory of Heinrich Fresenius. WILHELM FRESSENIUS. *Z. anal. Chem.* 59, No. 10, 11, 12, i-ix(1920). E. J. C.

Status of the analytical chemist. ARCHIBALD CRAIG. *Chem. Age* (N. Y.) 28, 474-5(1920). E. J. C.

The significance of adsorption in analytical chemistry. I. Introduction. I. M. KOLTHOFF. *Pharm. Weekblad* 57, 1510-5(1920).—Ostwald (*Wissenschaftliche Grundlagen der analytischen Chemie*) assumes that in filtration, amt. adsorbed (x) is proportional to concn. (c), or: $c = kx$. But k varies widely, being much less at low than at high concns.; hence O.'s equation: $x_n = [1/(km + 1)]^n x_0$ does not correctly express the amt. of adsorbed substance after n washings, unless c is const. This explains the frequently observed impossibility of washing ppts. or filters free from adsorbed substance. Adsorption on ppts. or filter paper is a prolific source of error in analysis; but it is also a useful aid in certain cases, as in the detn. of Pb in potable waters (Kolthoff, *C. A.* 11, 1704), the removal of small amts. of disturbing substances (decolorization of liquids), and in other similar ways. II. Filter paper and its capillary behavior. *Ibid* 1515-29. —The adsorbing capacity of filter paper for electrolytes depends only on its ash content; the ash acts like permutite, causing adsorption of a chem. nature: $\text{Ca-permutite} + \text{M}^+ + \rightleftharpoons \text{M-permutite} + \text{Ca}^{++}$. Anions are not adsorbed. The metal may be Pb, Cu, Hg, Cd, Mn or Fe; Ag, Co and Ni are adsorbed to a less extent, Zn only slightly, and Ba, Sr, Mg, K, Na, Li and NH_4 ions not at all. Alkaloids in dil. neutral soln. are strongly adsorbed. The prevailing belief that the capillary action of filter paper is due to its adsorptive power is subject to much doubt. Certain cases of slow filtration, as albumin and $\text{Al}(\text{OH})_3$, are due to coagulation of a colloid by the paper. It is possible to change the charge on a hydrosol from positive to negative by repeated filtration; for the paper tends to remove the positively charged particles from the hydrosol (Malariski, *C. A.* 13, 1174). This may be ascribed to the electrolytes present as impurities in the paper. Skraup, from his studies on capillarity (*C. A.* 4, 1925, 2597; 5, 17, 2021, 8188) developed the equation: $[(H - h)/h]c = K$ (where H is height of rise of solvent, h height of rise of solute, and c is concn.). Another equation, agreeing with observed

values about as closely as Skraup's and having the form of the equation for the adsorption isotherm, is: $L' = \alpha C^{1/n}$ (where L represents height of rise of solute compared to that of H_2O , C represents concn. and α and $1/n$ are const.). For HCl $\alpha = 252$, $1/n = 0.7$; for oxalic acid $\alpha = 132$ and $1/n = 0.56$. The equations hold very well up to concns. of about 0.1 N , where discrepancies begin to appear. Neither equation holds well for HCO_2H , $AcOH$, tartaric, citric or succinic acid at any concn. The same is true of NH_3 and weak org. bases; good agreement is found for strong bases. The anomalous behavior of the various acids of P and As seems to indicate that valence has some influence on capillary behavior. The fact that H_2S , HF , H_2SO_3 and HCN act much like strong acids in these expts. shows that there is no essential relation between the strength of an acid and its capillary rise on filter paper. The depth to which the paper in these expts. is dipped into the liquid has a great influence on the capillary rise; but there is no apparent connection between this influence and adsorption. In neutral solns. of salts of heavy metals, the capillary rise of the metal ion is much less than that of H_2O , but in slightly acid soln. the metal rises as high as the H_2O . In dil. solns. of mineral acids the H^+ does not rise so far as the anion; but cations (chiefly Ca^{+2}) are liberated from the impurities of the filter paper and rise to the same height as the anions and H_2O . The conclusion is that the effect of filter paper on the concn. of ions in solns. of electrolytes is a chem. phenomenon and not true adsorption. III. The adsorption of acids on filter paper. *Ibid* 1571-7.—The capillary behavior of various filter papers and cotton was studied, using solns. of HCl , H_2SO_4 , $HOAc$ and oxalic acid in concns. of 0.1 N or less (0.5 N or less for oxalic acid). There is a close connection between the alkalinity of the ash of the filtering medium and the amt. of acid taken up. The so-called ash-free papers have less power of fixation than untreated paper. These results confirm the conclusion reached in the preceding paper. IV. Adsorption of alkalies by cellulose. *Ibid* 53, 46-56 (1921).—Cotton and paper filters ext. $NaOH$ and KOH from aq. soln. (up to 2 N) in accordance with the partition law, following the equation: $x/m = \alpha C$ (where x/m is amt. taken from soln., expressed in mol. equivs.; C is concn. and α is a const.). This is not adsorption in the physical sense. Between 2 and 6 N the amt. removed greatly increases but becomes independent of the concn.; between 6 and 8 N there is a further sharp increase, again independent of concn. These facts indicate compd. formation and lend support to the similar findings of Vieweg (*C. A.* 2, 3403). Relatively more $Ba(OH)_2$ is removed from soln. (up to 0.3 N) than $NaOH$ or KOH . Practically no K_2CO_3 or Na_2CO_3 is taken up from solns. up to 0.5 N . Some NH_4OH is taken up from CO_2 -free soln. (up to 6 N) but the amt. is small and not related to the concn. Dil. acid readily removes all this NH_4OH from the filter. Paper often takes up NH_3 from the air; this possibility should be watched as a source of error in the qual. examn. of potable waters for NH_3 .

JULIAN F. SMITH

Review of the application of potentiometric titrations. I. M. KOLTHOFF. *Chem. Weekblad* 17, 659-64 (1920).—After explaining the principles on which the method is based the use is described of different electrodes, viz., H, Ag, Hg and Cu. The application of oxidation and reduction potentials is described, among the latter the detn. of iodide with chromate, iodate and dichromate, the detn. of Sb in the presence of Sn and the titration of As_2O_3 with I and of As_2O_5 with iodide.

J. B. KRAK

Iodometric studies. I. The determination of iodine by titration with sodium thiosulfate. BOHDAN KOHLER. *Chem. Listy* 14, 137-40, 195-9 (1920).—In titrating I in an acid medium with $Na_2S_2O_3$ the presence of a large excess I^- may cause an indefinite end-point. More than the theoretical amt. of $Na_2S_2O_3$ is required because a portion of the $Na_2S_2O_3$ is used up in a secondary reaction with HI . To limit the concn. of the I^- K. recommends the use of $KSCN$ instead of KI as an aid in dissolving the I (cf. Bruhns, *C. A.* 15, 351). When using this salt a min. acidity of 0.5 N is required. The titration of I with $Na_2S_2O_3$ produces $S_2O_4^{2-}$ quantitatively even in very acid solns.

(6 *N* HCl) if the concn. of the I^- is kept at a min. If KSCN is used the titration cal. be conducted in the presence of air since the concn. of I^- is so low that the error due to its oxidation may be considered negligible.

JOHN M. KENO

Micro-optical analysis of metals. A. BOLLAND. Cracow. *J. pharm. Belg.* 3, 1-4, 17-20(1921).—B. has devised a micro method for the detection of the metals in mixtures of their salts, without first effecting a separation, which consists in mixing the material with a liquid, the refractive index of which is known, and examining under the microscope with the aid of polarized light. The outlines of those crystals of which the index of refraction is the same or nearly the same as that of the liquid are totally invisible (in the case of isotropes) or partially invisible (in the case of anisotropes). The outlines of the other crystals are distinct. By using liquids with higher or lower refractive indices, the outlines of the non-visible crystals can be made to appear. On raising the objective a luminous line (Becke's line) running parallel to the outlines of the crystal becomes visible. This line elongates toward the substance reflecting the light most strongly, which enables one to identify the crystals of several salts in juxtaposition. B. has studied the following groups by this method: (1) the chlorides of NH_4 , Na, K and Mg. (2) The chlorides of Ca, Sr and Ba. (3) The chlorides of Ni and Co. (4) The chlorides of Mn and Zn. (5) The nitrates of Al, Fe and Cr. (6) The nitrates of Cd, Cu and Bi. (7) The sulfides of As, Sb and Sn. (8) The chlorides of Pb, Ag and Hg (ic). For the details of this study, the original paper must be consulted.

A. G. DUMERZ

Note on the precipitation of zinc with chromium. TOYOKICHI YASUI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 65-7(1919).—When Cr^{+++} is pptd. by NH_4OH in the presence of NH_4Cl , Zn^{++} if present is carried down with the $Cr(OH)_3$. About 18 quant. expts. were performed to det. how much Zn was carried down and to see whether the error could be avoided by reppn. The results show that the values obtained by a single pptn. are worthless and that with 3 pptns. the Cr results are approx. correct only when the quantity of Cr present is relatively small.

W. T. H.

A note on the hydrogen-ion concentration at which iron is precipitated from hydrochloric acid solution by ammonium hydroxide, sodium hydroxide and hydrogen sulfide. H. E. PATTEN AND G. H. MAINS. *Bur. Chem. J. Assoc. Official Agr. Chem.* 4, 233-4 (1920).—Fe in quantities up to 0.03% are held in HCl soln. at p_H up to 3.3 when pptn. is effected by NH_4OH , NaOH and H_2S . This value may conveniently be obtained in practice as follows: Add 4 drops of tetrabromophenolsulfonephthalein (0.1 g. in 250 cc. alc.) indicator soln. (C. A. 10, 68) to a 3-cc. portion of soln. in a test-tube. If the test shows no purplish tint add dil. NH_4OH to the main soln. dropwise with stirring. Test 3-cc. portions after each few drops until a faint tinge of purple is obtained when p_H will equal 3.3. If more than a tinge of purple is shown add dil. HCl similarly until the correct shade is obtained.

H. A. LEPPER

Rapid determination method for vanadium. WILL BAUGHMAN. *Salt Lake Min. Rev.* 22, No. 7, 36(1920).—Fuse the ore with 2 or 3 times its wt. of Na_2O_2 , extract the melt with H_2O , concentrate, acidify with H_2SO_4 , filter and add H_2O_2 . Compare the color of the pervanadic acid with that produced with known quantities of V. The presence of Ti, Cr and other elements interferes.

A. H. HELLER

The determination of potassium and sodium. A. QUARTAROLI. *R. Inst. Tecnico, Pisa. Gazz. chim. ital.* 50, II, 64-9(1920).—After a mixt. of KCl and NaCl is obtained as in the usual methods of analysis, the compn. of the mixt. can be detd. with accuracy by converting the chlorides into nitrates and detg. the f. p. of the mixt. Inasmuch as the greatest change is found when about 75% of one constituent is present, it is advisable to take the f. p. before and after adding a known quantity of KNO_3 and to use the more suitable value. As a basis of the method, the f. p. curve was constructed from the following values obtained (except with pure KNO_3) by heating tubes 3-4 mm. in

diam. in a H_2SO_4 bath, the reading being taken at the instant when the mixt. became opaque: pure KNO_3 336°, 95% KNO_3 312°, 90% 297°, 85% 283°, 80% 270°, 75% 255°, 70% 243°, 65% 231°, 60% 225°, 55% 220°, 50% 225°, 45% 231°, 40% 237°, 35% 245°, 30% 254°, 25% 265°, 20% 273°, 15% 280°, 10% 287°, 5% 297°, pure NaNO_3 306°. The eutectic lies at 55% KNO_3 -45% NaNO_3 . After obtaining the weighed mixt. of KCl and NaCl transform into nitrates by heating on an air bath with concd. HNO_3 . Dissolve in a little hot water, transfer to a watch glass and dry at 100°. Transfer a suitable quantity to a weighed tube and weigh. Det. the f. p. before and after mixing with a known quantity of pure KNO_3 . Compute the % KNO_3 present from the f. p. curve. An accuracy of 2° is sufficient inasmuch as a difference of 0.3% in the Cl content of the chloride mixt. will correspond to a variation of 10° in the f. p.

E. J. WITZEMANN

The action of thiodiglycol on silver salts. CHARLES MOUREU and MARCEL MURAT. *Chimie & Industrie* 4, 593-6(1920).—A study of the errors in detg. Cl as AgCl when $\text{S}(\text{CH}_2\text{CH}_2\text{OH})_2$ (A) is present. Three points are detd.: (1) the soly. of AgCl in A; (2) the influence of A in detg. chlorides, and (3) the influence of A in the detn. of HCl after hydrolyzing mustard gas (B). (1) The soly. was detd. by satg. A with AgCl , evapng. and drying at 300°. 122 g. of A dissolved 20.9 g. of AgCl . This does not consider whether it is a chem. or a physical soln. It is impossible to ppt. completely the AgCl from its A soln. by H_2O , 2.4% of the AgCl necessary to sat. A remaining after addition of H_2O in large vol. (2) Both the KCrO_4 and the KSCN methods for the detn. of Cl were vitiated by the presence of A, only approx. results being possible owing to darkening of the solns. (3) B was hydrolyzed in wts. from 0.3314 to 1.9184 g. by boiling 2 hrs. with 200 cc. H_2O , and Cl detd. by the KSCN method. The errors based on the theoretical varied from 0.4 to 10% too low. By adding known wts. of A from 0.5 to 1.5 g. to the hydrolyzed B in wts. from 0.2214 to 1.0320 g., the errors varied from 14 to 23% too high. It was found in general that A vitiates the detn. of Cl as AgCl , that the results are too high, and that the errors are greater the greater the proportion of A to the Cl compd. in the soln.

C. C. DAVIS

Determination of nitrites with the Griess reagent. P. N. VAN ECK. *Water* 1920, 127; *Chem. Weekblad* 17, 678.—Some salts, as NaCl , accelerate the nitrite reaction with Griess reagent; others have no influence; others, as borax, retard it. Certain org. compds. also retard the reaction, but this effect can generally be overcome by adding a little H_2SO_4 and NaCl .

JULIAN F. SMITH

Valuation of sodium hyposulfite. R. E. CROWTHER and A. D. HRYWOOD. *J. Soc. Dyers Colourists* 36, 279-81(1921).—Difficulty is experienced in obtaining concordant results in the valuation of $\text{Na}_2\text{S}_2\text{O}_4$ owing to the instability and lack of uniformity of the powder. In the usual methods it is impossible to take a sample large enough to compensate for the above-mentioned variations. In the recommended method one is directed to add 40 cc. of 40% formaldehyde soln. to 800 cc. air-free water in a graduated liter flask, then add 10 cc. 30% NaOH soln. and agitate the flask vigorously. Now add 8-12 g. $\text{Na}_2\text{S}_2\text{O}_4$ sample through a funnel and wash out the funnel with 10 cc. formaldehyde soln. followed by a little water. Dil. the contents of the flask to the liter mark. Pipet 25 cc. of a methylene blue soln. (14 g. per l.), which has been standardized against titanous chloride, into a 200-cc. Erlenmeyer flask, add 10 cc. of glacial AcOH followed by 50 cc. water. Heat the contents of the Erlenmeyer flask to boiling and add the formaldehyde soln. of $\text{Na}_2\text{S}_2\text{O}_4$ from a buret, while passing CO_2 through the flask. The $\text{Na}_2\text{S}_2\text{O}_4$ is added at a fairly rapid rate, but not fast enough to check the boiling. The end-point is a sharp change from bluish green to yellow. An indirect titration where an excess of methylene blue is titrated with standard TiCl_3 is also described. Accurate results are claimed for both methods. E. E. TICKET

Note on the behavior of neutral ammonium citrate in certain phosphate solutions. H. E. PATTEN and G. H. MAINS. *Bur. Chem. J. Assoc. Official Agr. Chem.* **4**, 235-8 (1920).—Neutral NH_4 citrate when added to HCl soln. of baking powder prevents the formation of a ppt. of Ca phosphate when NH_4OH is added. Ca phosphate is held up in HCl soln. more acid than $p_H = 2.3$ but ppts. at higher values. When neutral NH_4 citrate is added the p_H is shifted toward the alk. end, tending still further to ppt. the phosphate but the NH_4 citrate breaking up into citric acid forms Ca citrate which is sol. at p_H below 5. Between 5 and 7 pptn. is extremely slow in the cold but settles out overnight. Increase in temp. hastens pptn. At 7.1 an immediate gelatinous ppt. of Ca citrate is formed redissolved by large excess of neutral NH_4 citrate or small amt. of HCl .

H. A. LEPPER

The determination of the concentration of aqueous and alcoholic solutions by means of the immersion refractometer. B. WAGNER. *Sondershausen. Z. angew. Chem.* **33**, I, 262-4 (1920).—An address containing nothing new. J. J. MORGAN

The detection of denatured alcohol in beverages. P. HASSER. *Pharm. Zentralhalle* **61**, 613-6 (1920).—Acetone is best detd. by the method of Rothera, which uses a 25% soln. Na nitroprusside, and a mixt. of 30 g. $(\text{NH}_4)_2\text{SO}_4$ and 10 cc. concd. NH_4OH in 45 cc. H_2O . To 0.5 cc. of the liquor containing less than 50% alc. are added 1.0 cc. of the ammonia mixt. and 2-3 drops Na nitroprusside soln. If 0.01% acetone is present a permanganate-red color develops in 30 min. A rose-red indicates a less concn. and a blue-red a higher concn. of acetone. The HgCl_2 test is used for pyridine. Acidify with H_2SO_4 and conc. 10 cc. of the liquor to half its vol. by distn. After the residue is made alk. pyridine can be detected by its odor. When 0.3 cc. of a 2% HgCl_2 soln. is added to 1 cc. of the distillate needle crystals of the pyridine- HgCl_2 complex ppt.

H. A. SHONLE

Detection of methyl alcohol. C. SCHAPPER. *U. S. Naval Med. Bull. Supplement No. 15*, 15-7 (1920).—In a paper (*C. A.* **7**, 534) S. gives the results of a critical study of Denigès' fuchsin-bisulfite method for the detection of MeOH , and at present considers this the most reliable method but only when applied to distillates, since sugars and glycerol react like MeOH to this test. To obtain the most sensitive fuchsin-bisulfite soln., dissolve 0.5 g. finely powdered basic fuchsin in 200 cc. water, let stand overnight, add an aq. soln. of H_2SO_4 equiv. to 1 g. SO_2 and allow to stand until the soln. assumes an amber color (about 1 hr.). Make up to 400 cc. with water and preserve in glass-stoppered bottles in a cool dark place. It is emphasized that the reliability of the test depends wholly on the strict following of the technic. In performing the test it is advised to make parallel tests on a blank consisting of an equal quantity of pure EtOH and on a control consisting of EtOH containing 2% MeOH . L. W. RIGGS

A new reaction for aldehydes. Preliminary note. REMO DE FAZI. *Gazz. chim. ital.* **50**, II, 146-8 (1920).—Following de F.'s paper (*C. A.* **11**, 1144) on the color reaction of acenaphthene with cyclic aldehydes in the presence of concd. H_2SO_4 , Delmon and Guglielmelli (*C. A.* **12**, 1185) applied the test to the detection of furfural. De F.'s military service has delayed work on the reaction but many expts. have now convinced him that the supposed products are not obtained. With fluorene, however, he found that they are formed at the boundary of the H_2SO_4 and EtOH soln. of fluorene as an emerald-green ring that changes to a characteristic red-violet color. Such compds. have been obtained with fluorene and piperonylic, *m*-toluic, cuminic, *p*-dimethylamino-benzoic and other aldehydes. The reaction is thought to consist in a condensation by which the aldehyde O atom and the H of the CH_2 in the middle ring in fluorene is split off as H_2O . These products are sol. in abs. EtOH and when dissolved in concd. H_2SO_4 give the characteristic red-violet color.

E. J. WITZEMANN

A new reaction of saccharin. L. THÉVENON. *J. pharm. chim.* **22**, 421-2 (1920).—To a soln. of 0.1 g. saccharin in 25 cc. H_2O add 10 cc. of a soln. of 0.1 g. NaNO_2

in 100 cc. H_2O , and 6 drops of 33% H_2SO_4 . After a few min., add 0.1 g. β -naphthol. An intense red color is produced, which may be taken up by wool or silk. S. W.

Colloid chemical aspects of the theory of indicators (WIRGNER) 2. Titration bench (VAN WINKLE) 1.

GILL, AUGUSTUS H.: Gas Analysis for Chemists. Reprinted from "Standard Methods of Chemical Analysis," by Wilfred W. Scott. New York: D. Van Nostrand Co. 52 pp. \$1.25.

JOHNSON, ALFRED E.: Analyst's Laboratory Companion. London: J. and A. Churchill. 10s. 6d. For review see *Gas World* 74, 86(1921).

Detecting presence of gases in other gases by means of variations in conductivity for heat. SIEMENS & HALSKE, AKT.-GHS. Ger. 306,397, Apr. 23, 1914. The heating wire is placed so near the walls of the app. that the heat interchange between it and the walls is so great that the heat content of the gas passing through the app. is small in comparison with the heat supplied to the heating wire in the same time, whereby the influence of the velocity of the flow of gas on the indicator may be compared.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND WALTER F. HUNT

The Bragg crystal lattice and cleavage. RUDOLF SCHARIZER. Graz. *Z. Kryst. Mineralogie* 55, 440-3(1920).—The cleavages of diamond, fluorite, pyrite, sphalerite, and halite are considered in the light of the space-lattices detd. by the Braggs. Cleavage is found to be parallel to groups of lattice-planes if these contain like atoms. When the lattice-planes are equally distant, they must be similarly constituted, in order to have cleavage parallel to them. When there are several possibilities, the cleavage is parallel to that plane showing greatest reticular density. E. T. W.

The lattice-planes in isometric crystals. F. HAAG. Stuttgart. *Z. Kryst. Mineralogie* 55, 444-53(1920).—A mathematical discussion. The Bragg results on halite, diamond and pyrite are confirmed. E. T. W.

Identification of quartz particles in konimeter samples. A. W. ROGERS. *J. Chem. Met. Soc. S. Africa* 21, 11(1920); cf. *C. A.* 14, 2455.—Further expts. showed that while *o*-toluidine of n 1.57 worked well on dry quartz and mica dust, it was a failure on konimeter samples, as it did not dissolve the vaseline sufficiently. Dimethylaniline dissolved the vaseline, but rendered the quartz particles almost invisible, the dissolved vaseline lowering the n to the same av. as that of quartz. $CHBr_3$ and C_6H_5Br were tried. The liquid finally recommended was a mixt. of 5 pts. C_6H_5Br and 1 pt. α -bromonaphthalene, which is permanent, gives no crystals on keeping, practically nonvolatile and dissolves vaseline. Four parts of this mixt. plus 1 of vaseline of n 1.492 gave a mixt. having the required n , 1.57. L. W. RIGGS

Ultrabasite, a new mineral from Freiberg, Saxony. V. ROSICKY AND J. SYRBA-BÜHM. *Rozpr. české Akad. Prag* 25, No. 45(1916); *Z. Kryst. Mineralogie* 55, 430-9(1920).—This mineral is named from its extremely basic chem. compn. Its properties are: Color black, somewhat grayish; luster metallic; streak black; cleavage none; fracture scaly, with somewhat greasy luster on the surface. $H = 5$; sp. gr. = 6.026. System, orthorhombic-peri-tetragonal; $a:b:c = 0.988:1:1.462$. Habit thick-columnar, with vertical striations in the prism zone. Forms: $a(100)$, $b(010)$, $l(210)$, $m(110)$, $g(230)$, $n(130)$, $i(01\bar{5})?$, $k(012)$, $f(011)$, $r(102)$, $d(101)$, $e(114)$, $s(214)$, $? (218)$ and $? (126)$; dominant, m , n , d , and f . Most forms are incompletely developed; and there is some suggestion

of twinning. It decrepitates on heating, and at rather low temp. gives off white fumes. If finely powdered, it is slowly decomposed by HCl and HNO_3 , with the sepn. of some S. It is easily decomposed on fusion with alk. carbonates and nitrate. It gives tests for Pb, Ag and Sb, with traces of Fe and Cu, but no As nor Sn. Some disturbing element was found to be present, which proved to be *germanium*, as shown by the formation of coatings of GeS , purple, near the mineral, and GeS_2 , white, distant, on heating in a stream of H_2S . The Marsh test, as usually applied to As, gives a coating of Ge. Care must be taken, in analyzing, not to heat the mineral in contact with HCl, or the Ge will volatilize as GeCl_4 . For quant. analysis the mineral was treated with dil. HNO_3 , evapd. to dryness, and taken up with H_2O , whereupon the Sb and Ge oxides remained insol. The solid was treated with 15% KOH, whereupon the Sb and Ge dissolved, leaving Pb and Ag insol. The Sb and Ge were turned into Na-sulfo salts, treated with dil. H_2SO_4 , and the Sb_2S_3 was filtered off on a Gooch crucible in a stream of CO_2 . The filtrate was strongly acidified, and H_2S led in, the precipitated GeS_2 being treated as was Sb. The sepn. is only approximate, but the best that could be done under the circumstances. The other elements were determined in the usual ways. The compn. proved to be: Ag 22.35, Pb 54.16, Cu 0.47, Fe 0.25, Sb 4.60, Ge 2.20, S 16.15, sum 100.18%. This is regarded as corresponding to $11\text{Ag}_2\text{S} \cdot 23\text{PbS} \cdot 2\text{Sb}_2\text{S}_3 \cdot 3\text{GeS}_2$, with 1.6 excess S; or $\text{Ag}_{22}\text{Pb}_{54}\text{Sb}_4\text{Ge}_2\text{S}_{16}$. The mineral thus belongs toward the basic end of the sulfogermanates. The mineral was observed in 2 specimens collected by an English mineralogist, Walker, in 1829 and 1833, at the Himmelfurst mine, Freiberg. They show granite with a crust of quartz and rhodochrosite, on these galenite crystals, and still later the ultrabasic crystals, 8×5 mm. in size. Over the two last are tiny proustite crystals and the whole is covered by a second generation of quartz. [A somewhat simpler formula would be: $6\text{Ag}_2\text{S} \cdot 16\text{PbS} \cdot 2\text{GeS}_2 \cdot \text{Sb}_2\text{S}_3 \cdot \text{S}$, or $2 \times \text{Ag}_4\text{Pb}_8\text{GeSbS}_{14}$. Theory: Ag 21.8, Pb 55.6, Ge 2.4, Sb 4.0, S 16.2, sum 100.0%.—ABSTR.] E. T. W.

Leifite, a new mineral from Narsarsuk, Greenland. O. B. BÖGGILD. Copenhagen. *Z. Kryst. Mineralogie* 55, 425-9(1920).—See C. A. 11, 2561. E. T. W.

Dahlite from Kangerdluarsuk. O. B. BÖGGILD. Copenhagen. *Z. Kryst. Mineralogie* 55, 417-24(1920); cf. C. A. 11, 2652. E. T. W.

Phosphate-bearing pegmatites of the Upper Palatinate and Bavarian Forest Region. H. LAUBMANN AND H. STEINMETZ. *Z. Kryst. Mineralogie* 55, 523-86(1920).—Detailed descriptions of the localities are given, and 4 new minerals announced. **Phosphophyllite**. This is named from the compn., and the marked cleavage into sheets. Its properties are: Colorless to pale bluish green; luster, vitreous; transparent; cleavage c , perfect, also good on a and b . $H = 3-4$; sp. gr. = 3.081. System, monoclinic rhombohedral. $a:b:c = 1.0381:1:1.7437$; $\beta = 89^\circ 32'$. Mean $n = 1.65$; birefringence 0.025. Axial plane b ; cleavage flakes have the bisectrix outside the field of view. $2E = 75^\circ$; sign —. Analysis by Dr. Spengel, after deducting 3.66% insol. matter, gave: FeO 14.35, CaO 5.42, BaO 0.96, MgO 12.75, K_2O 9.00, Al_2O_3 6.48, P_2O_5 27.38, SO_3 9.71, H_2O 13.95, sum 100%. Some specimens contain Mn also. Suggested to correspond to $3\text{R}_3\text{P}_2\text{O}_8 + 2\text{Al}(\text{OH})\text{SO}_4 + 9\text{H}_2\text{O}$. [Since apparently formed under oxidizing conditions, much of the iron is probably ferric.—ABSTR.] This mineral represents a late development in cavities in corroded triplite at the pegmatite quarry at Habendorf. In this locality besides the usual pegmatite minerals (also natrolite and sphalerite), triplite is very abundant. An analysis is given; it contains 28.66% MnO and shows rough crystals agreeing approximately in angles with wagnerite. Triphylite is also present, showing 11.40 MnO. Both heterosite and purpurite occur as alteration products. Triplidite could be identified by its optical properties. Apatite is abundant, and analysis of one variety showed 4.93% MnO, making it a "manganapatite." Columbite in association with autunite is frequent. Secondary phosphates include vivianite (described crystallographically), duferenite (called "kraurite"), cacoxenite as-

sociated with "xanthoxene" (described below), some fairfieldite (identified optically), phosphosiderite, and strengite. The new minerals phosphophyllite (above) and "phosphoferrite" (below) are associated with the last 7. [This mineral needs further study. It is evidently related to the bendantite group, especially to hartite, $\text{SrO} \cdot 2\text{Al}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot \text{SO}_3 \cdot 5\text{H}_2\text{O}$. This relationship may be brought out by writing the formula of phosphophyllite: $\text{K}_2\text{O} \cdot 8(\text{Mg}, \text{Fe})\text{O} \cdot 3(\text{Al}, \text{Fe})_2\text{O}_3 \cdot 3\text{P}_2\text{O}_5 \cdot 2\text{SO}_3 \cdot 12\text{H}_2\text{O}$, which requires about: K_2O 6, RO 28, R_2O_3 20, P_2O_5 28, SO_3 11 and H_2O 14%.—ABSTR.] *Kreuzbergite*. This is named after the locality, Kreuzberg. Its properties are: Color, white to yellowish; cleavage pinacoidal (*c*). Sp. gr. 2.139. System, orthorhombic holohedral. $a:b:c = 0.3938:1:0.5261$. Mean $n = 1.62$; birefringence $= 0.02$; optic axial plane (001); $2V$ about 90° ; sign, —. Only sufficient material for qual. analysis was available. Chiefly an Al phosphate, with little Fe, Mn, H_2O , and doubtful F. It was of late formation, in cavities in quartz, often on corroded earlier phosphates in pegmatite at the Kreuzberg of Pleystein. Among these, triplite was identified by its optical properties and an analysis, showing 25.42 MnO. Apatite of probably primary origin is present. The secondary phosphates form the following series: (1) dufrénite (kraurite); (2) strengite, phosphosiderite, and the new mineral kreuzbergite; (3) vivianite, beraunite and cacoxenite; and (4) "Eisenpecherz" (colloidal iron hydroxide). The strengite crystals are described in detail; $a:b:c = 0.8663:1:0.9776$; analysis gave the normal formula, $\text{Fe}_3\text{O}_4 \cdot \text{P}_2\text{O}_5 \cdot 8\text{H}_2\text{O}$, although there is a difficultly explainable excess of Fe. The phosphosiderite is also fully described; $a:b:c = 0.5456:1:0.8905$; analysis agreed well with $\text{Fe}_3\text{O}_4 \cdot \text{P}_2\text{O}_5 \cdot 7\text{H}_2\text{O}$. The appearances of all the phosphate minerals in this section are described. In many respects this pegmatite resembles two others, of which full descriptions are given. That at Marchaney contains tourmaline, garnet, mica, sillimanite, staurolite, graphite, and various phosphates, the principal one being vivianite, with intergrown "kraurite" (dufrénite), and triplite. That at Wildenau-Plössberg contains among other minerals beryl, pyrite and arsenopyrite. There are also large masses of triplite, and some secondary apatite, dufrénite, cacoxenite, beraunite, phosphosiderite, and strengite; a mineral in minute rhombic crystals with $n = 1.60$ to 1.65 , probably reddingite; and also columbite and autunite. The mineral is noted to be crystallographically distinct from lucinite. [But if *a* is doubled, gives $a:b:c = 0.7876:1:0.5261$, which is very close to childrenite, $\text{Fe}^+\text{Al}(\text{OH})_2\text{PO}_4 \cdot \text{H}_2\text{O}$, and it may represent a variety of that species.—ABSTR.] *Phosphoferrite*. This is named from its compn., phosphate of Fe. It is indense to columnar crystalline masses. Luster, strongly greasy; color, white to yellowish or pale greenish; cleavage partial in one direction; fracture, splintery to conchoidal. H, 4–5; sp. gr., 3.165. Optically biaxial, +, otherwise similar to phosphophyllite (above). Analysis by Dr. Spengel gave, after deducting 5.13% insol matter: FeO 42.89, MnO 2.62, CaO 5.63, MgO 6.59, P_2O_5 37.31, ign. 4.96, sum 100.00%. This is suggested to correspond to an acid phosphate, $\text{H}_4\text{R}^+(\text{PO}_4)_3$ [but the "ign." may be in part F.—ABSTR.] It occurs in quartz, mica, sphalerite, and triphylite or triploidite, in the pegmatite at Habendorf. [This is rather near sarcopside (C. A. 14, 2146) which has RO 62, P_2O_5 35 and F 5%, and may be the hydroxy-representative of that mineral, $\text{R}_2(\text{OH})_2(\text{PO}_4)_4$.—ABSTR.] *Xanthoxenite*. This is named from the yellow color and the close relationship to cacoxenite. Its properties are: In thin plates under the microscope, seen to be monoclinic. Extinction angle 36° ; pleochroism strong. Birefringence about like that in cacoxenite ($n = 1.61$), and n higher. Axial angle, $2E$, about 115° . Sp. gr. 2.844. It dissolves in acid readily. It could not be sufficiently separated from intergrown minerals for quant. analysis. The P_2O_5 content is 32.81%, and qual. exam. shows also Fe, chiefly ferric, also less Mn and Ca, with a little Al and Mg. There is 16.10% H_2O , which is lost only at a high temp. It is intimately intergrown with dufrénite, and especially with cacoxenite, in the mass of secondary phosphates, to some extent at Habendorf (see above under

phosphophyllite) but especially at the quartz quarry at Hühnerkobel, Rabenstein. Here occur beryl, muscovite, "pseudo-triplitite," columbite, abundant accessory triphylite, in part altered into dufrenite, etc. Another type of alteration is into heterosite and some purpurite. Apatite is present, also its alteration products; some autunite and uranocher. Tourmaline is rare. The secondary phosphates comprise dufrenite, cacoxenite, vivianite, rarely secondary apatite, and fairfieldite (once called "leucomanganite"). This is determinable by its optical properties, and is probably what has been reported as "wavellite." Phosphosiderite, strengite, and beraunite are prominent. [This approaches beraunite (P_2O_5 31, H_2O 16%) and may be a variety.—ABSTR.] E. T. W.

Why the Lorraine ores are strongly phosphorus-bearing. L. CAVRUX. *Compt. rend.* 171, 1219–21 (1920).—C. attributes the presence of P largely to remains of fish, in a smaller degree to mollusks, and in an unknown amt. to the higher vertebrates.

L. W. RIGGS

Western sodium sulfate deposits. ANON. *Salt Lake Min. Rev.* 22, No. 10, 28–9 (1920).—In San Bernardino Co., Cal., 200,000,000 tons of Na_2SO_4 occur. Near Salt Lake, Utah, are beds which are free from Fe, but contain considerable silica. The beds in Nevada and Wyoming contain a mixture of silt and Na and Mg sulfates. Smaller deposits exist in Oregon.

A. H. HELLER

How oil is manufactured in Nature's laboratory. JAMES A. BISHOP. *Salt Lake Min. Rev.* 22, No. 13, 27–32 (1920).—A theory on the formation of oil-shale deposits in the Western States.

A. H. HELLER

The origin of petroleum. I. GENTIL. *Chimie & industrie* 4, 711–21 (1920).—A historical and critical review of the various theories regarding the origin and formation of petroleum, with special stress on the work and theory of the Roumanian geologists (Mrazec and Murgoci). In the subsequent discussion A. Guiselin, secy. of the International Petroleum Commission, stated he had discovered a document proving that the theory of the organic origin of petroleum had been first put forth by Lacoste in 1802.

A. P.-C.

Chemical researches on sediments. HERBERT E. MERWIN. *Bull. Geol. Soc. Am.* 31, 419–423 (1920).—This is one of a series of papers composing a symposium on sedimentation. The chem. problems involved in sedimentation must be viewed from many angles. From the standpoint of physical chemistry the problems are complicated because the solns. are very dil. and complex. Also the solid phases are not well defined. An important consideration respecting the consolidation of sedimentary rocks is the effect of differential stress, whereby material forced into soln. can be deposited on parts of grains which are less stressed or in open pores. Diffusion of the constituents of one crystal into another in contact with it, the relationship of nuclei and adsorbed material forming amorphous or fibrous minerals, and the role of catalysts which increase the rate of growth of crystals from soln., are a few questions concerning which little is known at present. As illustrative examples of the problems still awaiting complete soln., the origin of dolomite, oceanic red clay, and primary rock phosphates, are cited.

W. F. HUNT

Rare gases of the natural gases of Alsace-Lorraine. CHARLES MOUREU AND ADOLPH LEFAPE. *Compt. rend.* 171, 941–7 (1920).—Eight samples were taken, with special care to exclude air, from the petroleum deposits of Pöschelbronn, Sarre-et-Moselle potash mines of Wettelsheim, and from mineral springs of Niederbronn and Soultzmatt. The combustible gases in the samples from all but the last 2 sources, ranged from 89.25 to 98.98, av. 96.7% by vol. The same 6 samples contained no O, from traces to 1.49, av. 0.55% CO_2 , 1.0 to 9.09, av. 2.84% N, 0.0155 to 0.154, av. 0.044% A with traces of Kr and Xe, 0.002 to 0.015, av. 0.0069% He with traces of Ne. The petroleum deposits of Sarre-et-Moselle yield 31.5 million cu. m. of gas annually, containing 725 cu. m. of He. The ratios A/N_2 , A/N_2 in gas ÷ A/N_2 in air, He/N_2 , He/N_2 in gas ÷

He/N₂ in air, He/A, He/A in gas + He/A in air are worked out and correlated with the depth from which the sample was taken. From the data obtained the authors think that the gross N in natural gases rich in hydrocarbons is not of org. origin. The ratio He/A increases regularly and rapidly as a function of the depth. Suggestions are given concerning the genesis of the gases.

L. W. RIGGS

The closure of small cavities in rocks exposed to high pressure. J. JOLY. *Iveagh Geol. Lab. Phil. Mag.* 40, 681-91 (1920).—The effect of high pressure upon an interior cavity in a sphere of rock surrounded by Pb was studied at ordinary temp. Granite, basalt, obsidian and lithographic limestone were studied. Solid cubes were first examd. with reference to the pressure necessary to cause breaking down. The results agreed with those obtained by engineers for structural data. The granite cube broke at 35 tons and exploded at 36. Basalt cracked at 27 tons and exploded at 59. The limestone chipped at 50 tons and broke through the middle at 53. Spheres of basalt and granite were prepared 2 cm. in diam. composed of 2 hemispheres which were cemented together with Canada balsam after a small hemispherical cavity, 6.2 mm. in diam. had been ground in the center of the interior face of one of them. At intervals of increasing pressure the cavity was examd. under the microscope to det. the effect of the pressure. The results show that a pressure of 39 tons per sq. inch is sufficient to close the cavities in any of the 4 rocks. This pressure would correspond to temps. of 800° to 900° and is probably well above the critical closing pressure at these temps. Indications are that at 450° a pressure of 59,100 lbs. per sq. inch is near the critical pressure for granite and obsidian.

S. C. LIND

Essentials of the minute structure of crystals (RINNE) 3. Crystal growth and chemical affinity (VALENTON) 3.

LAKE, PHILIP AND RASTALL, R. H.: *A Textbook of Geology*. Third Ed. London: Edward Arnold. 508 pp. 21s. For review see *Nature* 106, 564 (1920).

9—METALLURGY AND METALLOGRAPHY

WILLIAM BRADY, ROBERT S. WILLIAMS

The value of research in mining and metallurgy. SAMUEL H. DOLBEAR. *Eng. Mining J.* 111, 384-5 (1921).

E. J. C.

The mining industry in 1920. ANON. *Eng. Mining J.* 111, 133-6 (1921). Base and precious metal production by states in 1920. ANON. *Ibid* 136. Imports and exports of metals and ores. ANON. *Ibid* 136. Copper. H. A. C. JACKSON. *Ibid* 137-8. Pig lead. ANON. *Ibid* 138-9. Zinc—market and metallurgy. W. R. INGALLS. *Ibid* 139-40. Tin. J. H. LANG. *Ibid* 140-1. Gold. H. N. LAWRIE. *Ibid* 141-2. Silver. PARKER D. HANDY. *Ibid* 142-3. Iron mining in the United States. D. A. E. CHARLTON. *Ibid* 144-5. Manganese. W. R. CRANE. *Ibid* 145-6. Tungsten market. CHAS. HARDY. *Ibid* 146. Tungsten mining. F. W. HORTON. *Ibid* 146-7. Chromite. SAMUEL H. DOLBEAR. *Ibid* 147. Nickel. THOMAS W. GIBSON. *Ibid* 147. Molybdenum. W. N. BRATTON. *Ibid* 147-8. Molybdenum market. CHAS. HARDY. *Ibid* 148. Platinum and palladium. JAMES M. HILL. *Ibid* 148. Quicksilver in California. FLETCHER HAMILTON. *Ibid* 148. Antimony. K. C. LI. *Ibid* 149. Arsenic. A. E. WELLS. *Ibid* 149. Bismuth. J. A. SAMUEL. *Ibid* 150. Cobalt. C. W. DRURY. *Ibid* 150. Uncommon ores and minerals. H. C. MEYER. *Ibid* 150-1.—Includes Cd, Ce, Se, Te, Ti and Zr. Uranium and radium. RICHARD B. MOORE. *Ibid* 151-2. Vanadium. RICHARD B. MOORE. *Ibid* 152. Bauxite and aluminium. JAMES M. HILL. *Ibid* 155-6. Metallurgy of

copper. E. P. MATHEWSON. *Ibid* 196-7. **Lead smelting.** JULES LABARTHE. *Ibid* 197-8. **Metallurgy of gold and silver.** P. A. ROBBINS AND HENRY HANSON. *Ibid* 198-9. **Recent trends in ore dressing.** ALFRED JAMES. *Ibid* 199-201. **Ferro-alloys.** ROBERT J. ANDERSON. *Ibid* 201-2.—Besides the reviews indicated above this review number of the *Eng. Mining J.* devoted to the world's mining industry in 1920 contains a number of articles reviewing the mining industry of various mineral-producing states of the U. S. and of such districts and countries elsewhere. See also abstract of reviews covering non-metallic minerals in Section 18 of this number of *C. A.*

E. J. C.

Secondary metals in 1919. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 51-85. (Preprint No. 7, published Jan 31, 1921.)

E. H.

Copper in 1918. B. S. BUTLER. U. S. Geol. Survey, *Mineral Resources of U. S., 1918*, Part I, 877-935. (Preprint No. 28, published Sept 28, 1920.)

E. H.

Lead in 1918. C. E. STREBENTHAL. U. S. Geol. Survey, *Mineral Resources of U. S., 1918*, Part I, 937-71. (Preprint No. 29, published Jan. 6, 1921.)

E. H.

The production of iron and steel in Canada during 1919. JOHN MCLEISH. Can. Dept. Mines. *Mineral Production of Canada, 1919* (Sep.), 45 pp. (1920.)

E. H.

The Hidachi copper smelter. CHAS. F. MASON. *Eng. Mining J.* 111, 55-7 (1921).—An illustrated description. A flow sheet is given.

E. J. C.

Sheet and tin mills. A. B. HOLCOMB. *Assoc. Iron and Steel Elec. Engineers* 2, 1-27, No. 11(1920).—The essential features of this type of mill are discussed with particular emphasis on the elec. equipment. 175-200 h. p. is required for a sheet mill and 125-150 for a tin mill. The power input to a set of cold rolls is about 40-50 h. p. per stand of 28 in. rolls running 38 r. p. m. The importance of a proper installation and care of illumination is emphasized. Av. production per mill-hr. is given as 1 ton for sheet mills and $\frac{1}{4}$ ton for tin mills. Energy consumption per ton for the main drive varies from 80 to 160 kw.-hrs. for sheet mills and is about 140 for tin mills. Power for auxiliaries, including the usual finishing departments, is 15-20% of the total plant load for the former and 25-30% for the latter. In discussion it was brought out that in 1914 the cost of power per ton of sheet was \$1.00 for motor drive and \$2.00 for engine drive.

W. E. RUDER

Control of blast-furnace operation. B. TOLLY. *Rev. metal.* 17, 615-8(1920).—A discussion of practical methods.

S. L. C.

McKume open-hearth port for coke-oven gas. H. SPENCE THOMAS. *Iron and Coal Trades Rev.* 102, 162(1921); 5 figs.—The Steel Co. of Canada has designed a port primarily for burning debenzolized coke-oven gas in the open-hearth furnace. It is said to eliminate completely the usual difficulties associated with its use and to increase greatly both the thermal and metallurgical efficiencies. Complete combustion is obtained by having both air and gas at all times under perfect control, thus preventing oxidation, and reducing to a minimum the amt. of N in the furnace. One 50-ton furnace equipped with this app. and working on ordinary producer gas of 550 B. t. u. per cu. ft. consumed 4.5 to 4.7 million B. t. u. per ton of steel as compared with about 5.8 to 5.9 million B. t. u. in ordinary open-hearth practice. The same furnace, using debenzolized coke-oven gas of 540 B. t. u., consumed 5.2 million B. t. u. per ton of steel. The greatest benefit derived from the McKume furnace is not the low fuel consumption, but the metallurgical advantage resulting from the gases in the steel being reduced to a minimum. The cost of reconstructing a furnace to this use was approx. \$6,035, while repairs averaged 3.5 cents per ton of ingots produced. The furnace may be run on tar or a mixt. of tar and coke breeze. The operation requires a minimum of attention and skill.

J. L. WJJEV

Slag formation in the basic Martin process. R. VONDRACEK. *Chem. Listy* 14, 94-5(1920).—Polemical. Comment on results reported by Quadrat (*C. A.* 15, 225).

JOHN M. KRNO

Slag formation in the basic Martin process. OTOKAR QUADRAT. *Chem. Listy* 14, 96-7(1920).—Polemical. An answer to Vondraček. (Cf. preceding abstr.)

JOHN M. KRNO

Tentative specifications for welded steel pipe. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 487-92(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, workmanship and finish, inspection and rejection.

E. H.

Tentative specifications for steel tie plates. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 493-6(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, workmanship and finish, marking, inspection and rejection.

E. H.

Tentative specifications for boiler and firebox steel for stationary service. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 497-501(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, permissible variations in wt. and thickness, finish, marking, inspection and rejection.

E. H.

Tentative specifications for carbon tool steel. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 502-3(1920).—The specifications cover manuf., chem. properties and tests, permissible variations and dimensions, finish, marking, inspection and rejection.

E. H.

Tentative specifications for low-carbon-steel track bolts. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 504-7(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, workmanship and finish, marking, inspection and rejection.

E. H.

Tentative specifications for electric cast steel anchor chain. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 508-11(1920).—The specifications cover manuf., physical tests, dimensions and permissible variations, finish, marking, inspection.

E. H.

Tentative specifications for steel plates for forge welding. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 512-17(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, finish, marking, inspection and rejection.

E. H.

Tentative specifications for commercial bar steels. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 518-21(1920).—The specifications cover manuf., chem. properties and tests, permissible variations in dimensions, workmanship and finish, inspection and rejection.

E. H.

Tentative specifications for extra refined wrought-iron bars. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 522-5(1920).—The specifications cover manuf., physical properties and tests, permissible variations in gage, finish, marking, inspection and rejection.

E. H.

Tentative definitions of terms relating to wrought iron specifications. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 526-7(1920).—Definitions are proposed for puddling, bushelling, fagoting, muck bar or puddled bar, common iron, merchant bar iron, refined bar iron or refined wrought-iron bars, and double refined iron.

E. H.

Tentative specifications for non-ferrous alloys for railway equipment in ingots, castings and finished car and tender bearings. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 528-32(1920).—The specifications cover chem. properties and tests, physical inspection and tests, lot, permissible variations in dimensions, workmanship, marking, inspection and rejection.

E. H.

Tentative specifications for bronze bearing metals for turntables and movable railroad bridges. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 533-4(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, finish, inspection and rejection. E. H.

Tentative specifications for white metal bearing alloys. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 538-41(1920).—The specifications cover manuf., chem. properties and tests, marking, claims. E. H.

Tentative specifications for aluminium ingots for remelting and for rolling. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 543-5(1920).—The specifications cover manuf., physical defects, sampling analyses, marking, claims. E. H.

Tentative specifications for aluminium sheet. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 546-8(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, permissible variations in dimensions, workmanship and finish, inspection and rejection. E. H.

Tentative specifications for light aluminium casting alloys. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 549-53(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, inspection and rejection. E. H.

Tentative specifications for pig lead. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 554-60(1920).—The specifications cover manuf., chem. properties and tests, marking, claims. E. H.

Tentative specifications for brass ingot metal for sand castings. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 561-3(1920).—The specifications cover manuf., chem. properties and tests, marking, claims. E. H.

Tentative specifications for bronze bearing metal in ingot form. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 565-7(1920).—The specifications cover manuf., chem. properties and tests, marking, inspection and rejection, claims. E. H.

Tentative specifications for solder metal. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 569-73(1920).—The specifications cover manuf., chem. properties and tests, marking, inspection and rejection, claims. E. H.

Tentative specifications for tinned soft or annealed copper wire for rubber insulation. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 574-9(1920).—The specifications cover manuf., chem. properties and tests, physical properties and tests, permissible variations, workmanship and finish, inspection and rejection. E. H.

Tentative specifications for sheet high brass. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 580-5(1920).—The specifications cover manuf., chem. properties, temper and anneal, physical properties and tests, permissible variation in dimensions, workmanship and finish, inspection and rejection. E. H.

Tentative specifications for aluminium for use in the manufacture of iron and steel. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 586-8(1920).—The specifications cover manuf., sampling, analyses, marking, claims. E. H.

Specifications for carbon steels other than tool steel. PERMANENT STANDARDIZATION COMMISSION OF FRANCE. *Rev. metal.* 17, 619-26(1920).—Specifications for terminology, test methods and permitted tolerances on the various classes of material involved. S. L. C.

Contribution to the theoretical study of the equilibrium diagrams of binary alloys. JEAN GALIBOURG. *Rev. metal.* 17, 630-4(1920).—G. demonstrates mathematically the generally accepted axiom that if a region containing two coexistent phases is bounded by a continuous curve there can be no change of phase, and, conversely, that a change of phase is accompanied by a discontinuity in the boundary. S. L. CHISHOLM

Metallographic investigation of the system bismuth-selenium. NAOJIRO TOMOSHIGE. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 55-60(1919); cf. C. A. 7, 3103.—T.

detd. by the cooling curve method the thermal equil. diagram for the system Bi-Se. **Conclusions:** (1) Two compds. are formed, the one, BiSe, decomp. at 602° into the other, BiSe (m. 688°), and Bi. (2) BiSe exists in 2 allotropic modifications with a transition point at 422°. (3) Between 51 and 90% Se, BiSe and Se are immiscible with the result that two liquids are formed. (4) Two eutectics are formed. One (m. 267°) consists practically entirely of Bi, the other of BiSe and Se and melts at 161°.

F. P. FLAGG

Metallographic investigation of the system tungsten-lead. SUKKICH INOUE. *Mem. Coll. Sci. Kyoto Imp. Univ.* 4, 43-6(1919).—I. detd. by the cooling curve method the thermal equil. diagram for the system W-Pb for mixts. of the 2 varying from 0 to 30% W and for temps. up to 1300°. The investigation was not carried further because Pb boils at 1470°. His conclusions do not confirm the results of previous workers (*Ber.* 35, 909(1902)). **Conclusions:** (1) At temp. as high as 1300° Pb dissolves W up to 30%. (2) W seps. as primary crystals from the melt and the remainder freezes as a eutectic (m. 328.4°) which is almost pure Pb. (3) There is no indication of the formation of a compd. in alloys high in Pb and probably none is formed in alloys high in W on account of the low b. p. of Pb.

F. P. FLAGG

Metallographic methods for determining the nature of nonmetallic inclusions in iron and steel. M. MARVEIEFF. *Rev. metal.* 17, 736-52(1920).—M. gives a detailed and exhaustive summary of reagents and methods used in detg. metallographically the possible nonmetallic inclusions in iron and steel. In addition to the methods commonly used, he advocates the use of H for O (FeO), and 0.2% aq. oxalic acid for FeS and MnS.

S. L. CHISHOLM

How treatments affect gear bronze. AUSTIN B. WILSON. *Foundry* 48, 915-9 (1920).—The results are given of a study of the metallographic and mechanical properties of a typical gear bronze. 26 photomicrographs show the characteristic structure of different parts of a gear and the changes produced by heat treatment.

JAS. O. HANDY

An industrial apparatus for thermal treatment tests. PIERRE CHEVENARD. *Rev. metal.* 17, 687-95(1920).—Since the thermal properties of complex steels are affected by very slight variations in compn. it is often desirable to make individual tests of thermal characteristics in order to det. the treatment required for the av. or the extreme case, as well as to classify together those adapted to identical treatment. For the necessary com. precision a simple pyrometric dilatometer has been successfully developed which registers continuously on a revolving chronographic drum by means of a multiplying lever the dilation of the test piece heated electrically in a quartz tube. Suitable means are incorporated automatically to provide the heat treatment desired, and the heating and cooling curves are obtained in a single test.

S. L. CHISHOLM

Guides to analyses. II. Application of chemical analyses to works practice in the iron and steel industries. L. W. SPRING. *Chem. Bull.* 7, 300-1(1920).—The C and Si content, tensile strength, elongation, welding properties and principles uses of 16 com. grades of Fe and steel are tabulated.

W. T. H.

Electro-percussive welding. ANON. *Elec. World* 77, 376(1921).—Production of large quantities of duplicate parts which require welding has been found to be expedited by this process, which consists essentially of a device for producing a percussion of the parts to be welded simultaneously with a discharge of elec. energy. This is taken from a condenser or a magnetic field. Use is made of electrolytic condensers or of the energy stored in a magnetic field, the discharge taking place between the points to be welded with explosive violence, at which instant the hammer forges the parts together into a perfect union. The time of fusion and union is about 0.0095 sec. Oscillograms taken during a weld between 3/8" Cu and steel rods indicated a peak current of 2,600 amps., a voltage of 30, a max. of 60 kw., and an energy consumption of 0.00077 kw.

hr. At least $\frac{1}{4}$ of the power is saved as compared with butt welding. Production depends almost entirely upon the time required to handle the pieces. Unusual welds may be made, such as welding small rods to heavy blocks without previous treatment of the surface. As only a very small area is heated the method may be safely used where loss of temper would be injurious. Unlike metals are readily welded. After proper adjustment, the quality of the weld is independent of the skill of the operator. This process also produces a smaller fin, which reduces the cost of finishing. W. E. R.

Correct current values for welding with metallic electrodes. WILLIAM SPRARAGEN. *Elec. World* 77, 50(1921).—Correct current value is an important factor in elec. welding. A number of $\frac{1}{8}$ -in. plates was welded in 16 different plants. An analysis of the results of physical tests revealed no differences in the mechanical properties whether the welds were made with bare or flux-covered electrodes or with a. c. or d. c. It was noticed, however, that the strongest and most ductile welds were made with a high current. The currents that seem most favorable for mild-steel plates are as follows: plates up to $\frac{1}{8}$ in., 25–50 amp.; up to $\frac{1}{4}$ in., 50–90 amp.; $\frac{3}{16}$ to $\frac{1}{2}$ in., 75–160 amp.; $\frac{5}{16}$ in. up, 125–200 amp.; $\frac{1}{2}$ in. up, 175–200 amp. The av. operator should use a higher current than has heretofore been the practice. LOUIS JORDAN

Desirable qualities in welding electrodes. C. J. HOLSLAG. *Elec. World* 77, 157(1921).—Mild steel electrodes with a combined slag and flux covering give the best results. The flux-coated electrode has chemicals which pass into the arc with the steel, freeing the steel of oxide, and volatilizing, while the slag-coated electrode furnishes a covering (and sometimes an envelope) for the molten metal. The most suitable coverings are: an inorg. salt, generally a silicate, a fluxing reagent such as Al, Ti, B and Mg together with an inert substance (Ca compd.) to separate the slag quickly. Structure and d. are important as well as chem. analysis. High-C, high-Mn, Cr, Ni and V steel alloys have been successfully welded. W. H. BOYNTON

Méker burners and Méker furnaces (STAVORINUS) 1. High-speed cast-steel tools from the electric furnace (BUNNELL) 4. Corrosion of iron in sulfuric acid (HEISS, CLEMENTS) 6. Photo-elasticity for engineers (COKER) 13. Paint for iron or steel (U. S. pat. 1,367,597) 26. Asbestos fabrics (for filtering blast-furnace gases) (Brit. pat. 153,558) 18.

Annual Statistical Report for 1919 of the American Iron and Steel Institute. New York: The Am. Iron and Steel Inst., 61 Broadway. 96 pp. For review see *Eng. Mining J.* 3, 113(1921).

Research and Methods of Analysis of Iron and Steel. Second Ed. Middletown, Ohio: The American Rolling Mill Co. 220 pp. For review see *Iron Age* 107, 237(1921).

Ore-flotation. J. M. CALLOW. U. S. 1,366,766–7, Jan. 25. Mechanical features.

Ore-flotation. R. S. TOWNE and F. B. FLINN. U. S. 1,367,332, Feb. 1. Mechanical features.

Ore-separator. E. B. HOOVER. U. S. 1,366,660, Jan. 25.

Concentrating ores. G. S. A. APPELQVIST and E. O. E. TYDEN. U. S. 1,367,223, Feb. 1. The pat. relates to mechanical features of mixing ore with selective sepn. agents.

Recovering metals. K. HESS. Brit. 153,875, Nov. 12, 1920. Metals, for example Al and Mg, are recovered from chippings, residues, and ashes by introducing them in small quantities into a bath of molten salt in a furnace heated by tangential flames, the charging opening extending down to the surface of the salt. The melted

metal collects in a layer under the salt while the impurities rise to the surface. The furnace is discharged through openings.

Electric-resistance heater for melting furnaces. A. VON ZIEGLER. U. S. 1,367,442, Feb. 1.

Treating copper sweeps and scraps. C. C. LYTO. U. S. 1,367,763, Feb. 8. Cu sweeps and scraps are roasted at a temp. below 600° in the presence of NaCl to transform their entire Cu content into chloride which remains in the roasted material. The latter may then be extd. with dil. H_2SO_4 . The process is suitable for treating foundry or smelter refuse containing Cu 5-10, Zn 3-8, Fe 2-6, Sn and Sb 1-2, SiO_2 75-80, and org. matter 10-5%.

Tempering metals. G. S. CRAWFORD. Brit. 153,424, Sept. 16, 1919. An app. for indicating the crit. temp. of Fe, etc., comprizes a magnet suspended from a tube and connected by a wire with an indicator, so that the demagnetization test may be applied directly to the metal in the furnace. The magnet has four or more legs, depending from a common base and is preferably machined from a solid block of steel.

Casting metals. J. E. HURST and F. W. STOKES. Brit. 154,062, Nov. 18, 1919. The inner surface of the mold of a centrifugal casting machine is maintained at $600-700^{\circ}$. The mold may be originally heated by electricity or gas or by making a number of castings which are scrapped; by adjusting the thickness of the mold and rate of casting, this temp. may be maintained. For an Fe casting 5-10 mm. thick and weighing about 15 lb., a cast-Fe mold should be $2\frac{1}{2}$ -3 in. thick and the castings should be produced at 40-60 per hr. If a liner is used, it should be in intimate contact with the body of the mold.

Magnetic tests. C. W. BURROWS and R. J. WIG. Brit. 153,748, Oct. 10, 1919. Magnetizable metal bodies such as rods, cables, rails, etc., are continuously tested for defects by passing through a magnetic field containing a pair of oppositely wound test coils, and observing variations of electromotive force induced in these coils by variations in the magnetic field caused by inhomogeneities in the material under test. A suitable app. is specified.

Purifying molten slag. J. LUND. U. S. 1,366,398, Jan. 25. Molten slag is purified in order to render it suitable for cement *manuf.* or other uses by applying heat to the under surface of slag, e. g., in a horizontal rotary furnace containing molten Fe, while at the same time treating the upper surface of the slag with basic or acid ingredients to adapt it for its particular intended use.

Apparatus for rapid hardness tests of metals by the Brinell ball method. R. GULLAEGY. U. S. 1,367,133, Feb. 1.

Wrought iron. E. E. ELLIOTT. Brit. 153,523, Mar. 15, 1920. Wrought Fe is made by heating a charge of pig and scrap mixed with Fe ore or oxide in a wrought Fe or steel container constructed so as to facilitate the escape of slag and gases formed during the boil. The container consists of a divided shell or casing resting upon a base-plate and held in position by lugs and eventually unites with the charge. According to the Provisional Specification, HOAc may be used as a refining material.

Steel from iron ore. C. B. HILLHOUSE. U. S. 1,366,383, Jan. 25. Fe ore is reduced to sponge in a rotary kiln, by suitable regulation of the temp. and reducing material supplied to the kiln, and the product is combined with such auxiliary materials as are required to convert the sponge into steel of the desired compn.

Vanadium steel. W. M. GOODWIN and A. F. G. CADZENEHEAD. Brit. 153,926, May 16, 1919. See U. S. 1,359,473 (C. A. 15, 360).

Heat treatment of steel. C. P. SANDBERG and J. C. W. HUMPHREY. Brit. 153,756, Oct. 20, 1919. Steel, after being heated to above the critical temp., is cooled in proximity to an electromagnet so that when the crit. temp. is reached and the steel regains its magnetic properties, the attraction of the electromagnet may be arranged to give

an indication that this temp. has been reached and, if desired, to effect a stoppage of the cooling. A suitable construction is specified.

Steel ingots and billets. R. A. HADFIELD. U. S. 1,367,545, Feb. 8. A comparatively small charge of a steel base is melted under basic conditions and the molten charge is refined to eliminate P, S and O from it. The purified steel is removed from the refining zone and is allowed to cool so far as possible while still permitting casting without undue sculling action. The partially cooled steel is then cast into ingots of relatively small size and the upper portion of the metal of each ingot is maintained in a molten condition while the lower portion is cooling and solidifying. This method is especially adapted for treating special steels for airplane construction.

Alloy steels from iron oxide. C. M. JOHNSON. U. S. 1,366,662, Jan. 25. Alloy steel is prepd. by adding ferro-Si and ferro-Cr to the charge of a smelting furnace in which Fe oxide is smelted. Ferro-V also may be added.

Controlling grain growth in magnetic alloy sheets. V. B. BROWNE. U. S. 1,367,015, Feb. 1. Si steel sheets are made from an ingot by gradually heating the ingot to about 815° and then raising the temp. to forging temp., reducing the ingot to sheet form and during the reduction carrying on the necessary heating between passes in an oxidizing atm. Pressure upon the sheets in the final pass is controlled in accordance with the temp. so as to regulate the size of the grain produced in the finished sheets after annealing.

Alloys. H. C. HALL. Brit. 153,823, Feb. 25, 1920. An Al alloy contains about 4-12% of Cu and 0.12-2.2% of Ti with or without not more than 1.5% of Sb or Mg, or both. Fe up to 0.6%, and Si up to 0.4%, and other impurities up to 0.5% may also be present. The alloy may be made by first prepg. an Al-Cu-Ti alloy and adding this in small pieces to a bath of molten com. Al, with or without the simultaneous addition to the bath of an Al-Cu alloy.

Alloys. H. C. HALL and ROLLS-ROYCE, LTD. Brit. 153,514, Feb. 25, 1920. An Al alloy contains about 0.1 to less than 3% of Cu, 0.1-2% of Ti, and 6-18% of Zn, with or without not more than 1.5% of Sb or Mg or both in place of a corresponding amt. of Al. Fe up to 0.6%, and Si up to 0.4% may also be present. The alloy may be made by first prepg. an Al-Cu-Ti alloy, Zn being afterwards added. Sb and Mg, if required, are preferably added last with a small percentage of the Zn.

Electric contact-point. J. H. MULLER. U. S. 1,367,752, Feb. 8. An alloy of Au 90 and Ni 10% is used for elec. contact points.

Soldering enamel ware, etc. W. B. JOHNSON-LAIRD. Brit. 153,445, Oct. 10, 1919. In tinning and soldering porcelain enamel ware, the solder is applied to the glazed surface of the enamel or to both the enamel and any exposed Fe portion, by the use of a steel brush or other steel tool without the aid of a soldering-iron or flux. The surface is cleaned and brightened and the vessel then heated over a gas ring, etc. Solder is then applied by the steel tool, etc., until the surface is tinned and more solder is then applied. The solder may consist of 30% of Sn, 10% of Zn and 60% of Pb. According to the provisional specification, the solder may consist of 75% of Sn, 15% of Zn and 10% of Pb.

Brazing. A. J. LIGOT. Brit. 153,704, Aug. 26, 1919. A brazing stick particularly for blowpipe brazing consists of a tube of brass or other metal containing brazing alloy combined with a flux without any binding or thickening agent, such as a fat. The brazing alloy and flux may be in granulated, foliated, or wire form or in thin or small pieces. After the tube is filled, it is flattened to force the grains into the wall of the tube and prevent escape when the stick is held vertically. The stick may have a wrapping of paper, linen, etc., together with an agglomerant for strengthening purposes.

Electrical welding. C. H. KICKLIGHTER. U. S. 1,367,552-3, Feb. 8. Mechanical features.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER.

o-, *m*-, and *p*-Tolylazo- α -naphthylhydrazinosulfonic acids. J. TRÖGER AND G. LANGE. *J. prakt. Chem.* 101, 123-35(1920).—The method of prep. *m*-tolylazo-*m*-tolyl-*p*-hydrazinosulfonic acid by passing SO_2 into *m*- $\text{MeC}_6\text{H}_4\text{N}_2\text{SO}_3\text{K}$ as described by T. and Hille (cf. *J. prakt. Chem.* 68, 297(1903)) is not of general application, since the corresponding Ph compds. can be prepd. only within certain very narrow limitations. More recently it has been shown (cf. T. and Puttkammer, *C. A.* 1, 1018; T. and Westerkamp, *C. A.* 4, 1802) that these hydrazino acids can be obtained synthetically, yielding intensely colored compds., the yields depending on the ease with which the original NH_2 compds. can be diazotized. T. and L. have now extended the study of these reactions to the prepn. of compds. containing different aryl residues attached to the azo and hydrazino groups in the same mol. *p*-Tolylazo- α -naphthylhydrazinosulfonic acid (A), $\text{MeC}_6\text{H}_4\text{N}_2\text{C}_{10}\text{H}_7\text{NHNHSO}_3\text{H}$, bluish violet flakes, is best prepd. by adding 2 g. powdered NaNO_2 in 2-3 portions to a mixt. of 15 g. $\text{MeC}_6\text{H}_4\text{N}_2\text{C}_{10}\text{H}_7\text{NH}_2$ (cf. Normann, *C. A.* 7, 972) in 45 g. HCl (25%) + 500 g. H_2O at 20° and turbing for 1 hr. The dark brown soln. is then filtered into K_2SO_3 soln. made alk. with K_2CO_3 , whereupon amorphous reddish brown flakes of the labile diazo potassium salt sep., which, on standing for 24 hrs., change into the dark brown stable salt. The moist salt is then triturated with an equal amt. of $(\text{NH}_4)_2\text{S}$, 35 vols. H_2O added, and the soln. boiled for 30 mins. On cooling long, brown needles of the potassium salt of A sep.; this is decompd. with hot concd. HCl , and the resulting A purified by digesting with warm, concd. AcOK , and repptd. with HCl . The hydrazinosulfonic acids react with aromatic aldehydes according to the equation $\text{C}_7\text{H}_7\text{N}_2\text{C}_{10}\text{H}_7\text{NHNHSO}_3\text{H} + \text{RCHO} \rightleftharpoons \text{C}_7\text{H}_7\text{N}_2\text{C}_{10}\text{H}_7\text{NHN}:\text{CHR} + \text{H}_2\text{SO}_3$. The following derivs. of A were prepd.: *o*-hydroxybenzylidene-*p*-tolylazo- α -naphthylhydrazone, by warming equimol. amts. of A and *o*- $\text{HOC}_6\text{H}_4\text{CHO}$, which had been moistened with alc. HCl , on a H_2O bath for 15 mins., allowing to stand at room temp. for several hrs., and decomp. the resulting salt by warming with NH_4OH , reddish brown prismatic needles from $\text{AcMe} + \text{little H}_2\text{O}$, *m.* 166.5° , hydrochloride, dark, moss-green cryst. powder; cinnamylidene, similarly prepd. from A and $\text{PhCH}:\text{CHCHO}$, reddish brown prisms from $\text{AcMe} + \text{H}_2\text{O}$, *m.* 168.5° , hydrochloride, dark powder with greenish luster; anisylidene, small brown lustrous crystals from alc., *m.* 156° , hydrochloride, short, dark green crystals; *p*-tolylidene, short brown crystals from $\text{AcMe} + \text{H}_2\text{O}$, *m.* 159° , hydrochloride, bluish black crystals. *o*-Tolylazo- α -naphthylamine, which is necessary for the prepn. of the *o*-series of the above compds., was first prepd. according to the method of Charrier (cf. *C. A.* 5, 1744). A purer product, however, was obtained when prepd. in the following manner: a diazo soln. made from 10 g. $\text{MeC}_6\text{H}_4\text{NH}_2$, 45 g. HCl (25%) and the calcd. amt. NaNO_2 at 1° , is added gradually in 5 portions to α - $\text{C}_7\text{H}_7\text{NH}_2$ in alc. at 45° . The resulting salt is decompd. with NH_4OH and the base crystd. from ligroin, long, bright red lustrous needles *m.* 99° , hydrochloride, violet needles with green iridescence; sulfate, pale violet crystals; nitrate, dark green crystals from dil. alc. The free base was converted into *o*-tolylazo- α -naphthylhydrazinosulfonic acid (B) (dark violet, amorphous flakes), in a manner similar to the prepn. of A. The diazotization, however, was completed in 20-30 mins.; potassium salt, brown lustrous leaves. The following hydrazones of B were prepd.: *o*-hydroxybenzylidene, $\text{C}_7\text{H}_7\text{N}_2\text{C}_{10}\text{H}_7\text{NHN}:\text{CHC}_6\text{H}_4\text{OH}$, stout, dark brown crystals, *m.* 162° , hydrochloride, greenish cryst. powder; cinnamylidene, brown prisms from AcMe , *m.* 170° , hydrochloride, black cryst. powder; anisylidene, brown lustrous leaves from dil. AcMe , *m.* 153° , hydrochloride, small, deep blue crystals; *p*-tolylidene, brown, lustrous leaves from dil. AcMe , *m.* 152° , hydrochloride, black, lustrous powder. *m*-Tolylazo- α -naphthylamine (C) was prepd. in a manner analogous to that of the corresponding *o*-compd.,

reddish blue crystals, m. 107° ; *nitrate*, small, bluish violet needles; *hydrochloride* + $2\text{H}_2\text{O}$, dark, silky needles having a greenish luster, from dil. alc.; *sulfate*, steel-blue crystals which lose H_2O at 105° , and change to green. From C was obtained *m*-tolylazo- α -naphthylhydrazinosulfonic acid in a manner similar to the prepn. of the *o*- and *p*-comps., violet crystals; *potassium salt*, reddish brown needles from H_2O ; *anisylidene hydrazone*, $\text{C}_7\text{H}_7\text{N}_2\text{C}_{10}\text{H}_6\text{NHN}:\text{CHC}_6\text{H}_4\text{OMe}$, small brown crystals from dil. AcMe, m. $159\text{--}60^{\circ}$; *hydrochloride*, dark blue cryst. powder.

D. BRÉSSÉ JONES

Influence of electronegative groups on the stability of the methylene-hydrogen atoms in arylsulfonated methylene derivatives. J. TRÖGER AND E. NOLTE. *J. prakt. Chem.* 101, 136–57 (1920).—It has been shown by T. and co-workers that the electronegative groups Ph and CN, and especially RSO_2 , in such compds. as $\text{RSO}_2\text{CH}_2\text{CN}$ (R = aryl), greatly affect the stability of the methylene H atoms. These compds. form salts with cold NaOH, from which, on acidifying, the original acids can be recovered. The methylene H atoms are replaceable by alkyl radicals, react with NH_2OH , giving oximes, forms condensation products with aldehydes, and hydrazones with diazonium salts. The influence of Br and Cl is also shown in that *p*-Cl- and *p*-Br- $\text{C}_6\text{H}_4\text{SO}_2\text{CH}_2\text{CN}$ form solid Na compds., while $\text{PhSO}_2\text{CH}_2\text{CN}$ does not (cf. T. and Vasterling, *J. prakt. Chem.* 72, 336). RSO_2 and RCO_2 do not have the same electronegative character. The methylene H atoms in $\text{RCO}_2\text{CH}_2\text{COMe}$ are very reactive, while those in the aryl-sulfoneacetones, $\text{RSO}_2\text{CH}_2\text{COMe}$, are but slightly (cf. T. and Beck, *C. A.* 7, 2543). That Ph and EtSO_2 have weaker electronegative properties than PhSO_2 has been shown by Lawes (cf. *Ber.* 25, 347 (1892)). The purpose of the work described in the present article was to det. whether sulfones of the general formula, $\text{XC}_6\text{H}_4\text{SO}_2\text{CH}_2\text{C}_6\text{H}_4\text{X}$ or $\text{XC}_6\text{H}_4\text{SO}_2\text{CH}_2\text{Ph}$ (X = halogen, NO_2 , or OH) contained replaceable H atoms in the CH_2 group. They were found, however, to be insol. in alkalis, and unreactive towards condensing reagents. The acid character of the CH_2 was not increased, since the negative groups introduced were too far removed from the CH_2 . When, however, NO_2 or CN is introduced nearer to the CH_2 , as in $\text{RSO}_2\text{CH}_2\text{NO}_2$ or $\text{RSO}_2\text{CH}_2\text{CN}$, such compds. form salts and condensation products. The di-Me compd., *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{CMe}_2\text{Ph}$, reported by Fromm and Wittmann (*C. A.* 2, 2932) to have been obtained by the action of MeI and NaOH on *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{CH}_2\text{Ph}$, was not the di-Me compd., but the unchanged original sulfone, since it was found that the original sulfone does not form a salt with NaOH nor give condensation products. The corresponding *m*-compd. was also insol. in alkalis, and indifferent toward condensing reagents, showing that the NO_2 group, when situated at such a distance from the CH_2 , confers upon the latter little or no acidic properties. *Phenylsulfone-m-nitrophenyl-methane*, *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{SO}_2\text{Ph}$, was prepd. by heating equimol. amts. of *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$ and PhSO_2Na in alc. until the odor of the Cl deriv. could no longer be detected, white, lustrous needles from CHCl_3 or AcOH, m. 163° . The following *phenylsulfone-methane derivatives* were further prepd.: *o-nitrophenyl*, lustrous needles from AcOH, m. 113° ; *p-nitrophenyl*, white cryst. crusts from AcOH, m. 207° ; *o-aminophenyl*, by reducing the corresponding NO_2 deriv. with HCl and Sn, brown needles, m. 174° ; *hydrochloride*, irregular leaves; *m-aminophenyl*, brown stout needles from alc., m. 139° ; *hydrochloride*, needle aggregates; *p-aminophenyl*, analogously prepd., m. 176° (previously prepd. by Hinsberg and Himmelschein (cf. *Ber.* 29, 2022 (1896))) from *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{OH}$ and PhSO_2H , and described as “aminophenyl tolyl sulfone”). All of the above compds. were insol. in 15% NaOH, and exhibited no acidic properties of the CH_2 , which was likewise true of the *m-hydroxyphenyl derivative*, prepd. by diazotizing the corresponding NH_2 deriv., stellar clusters of needles, m. 125° . When heated for 25 hrs. on a H_2O bath with MeI and Na it gave the *methyl ether*, $\text{PhSO}_2\text{CH}_2\text{C}_6\text{H}_4\text{OMe}$, but no substitution of H in the CH_2 took place. *Phenylsulfonenitromethane* (A), $\text{PhSO}_2\text{CH}_2\text{NO}_2$, was obtained from ClCH_2NO_2 and PhSO_2Na (the latter prepd. according to the method of Preibisch (*J.*

prakt. Chem. 8, 316(1873) and Tscherniak (*Ber.* 8, 608(1875)), b. 122-3°, heavy oil causing tears. The prepn. was attended with unusual difficulties, and the yield was very poor. It was best prepd. by heating for 8-10 hrs. PhSO_2Na and ClCH_2NO_2 with a little alc., removing the alc., extg. with Et_2O , shaking the latter with NaOH and then acidifying. The resulting milky ppt. crystd. on standing, crystals from CHCl_3 , m. 151°. Repeated subsequent attempts to obtain this same product were unsuccessful; instead an oil was obtained, which solidified on long standing, white, somewhat gelatinous ppt. on acidifying its alk. soln., m. 69-72°. It probably contained some PhSO_2H . With PhN_2Cl it yielded a compound m. 139°, radiating clusters of reddish yellow crystals from dil. alc., probably a hydrazone or an azo deriv. Despite the unsatisfactory character of these expts. they show, however, that A contains easily replaceable methylene H atoms. The following compds. of the general formula $\text{XC}_6\text{H}_4\text{SO}_2\text{CH}_2\text{C}_6\text{H}_4\text{NO}_2$, which were insol. in alkalis, were prepd. by heating the Na halogen sulfonates with an equimol. amt. of $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$ in alc.; *p*-chlorophenylsulfone-*p*-nitrophenylmethane, needle aggregates from alc., m. 162°; *m*-nitro derivative, lustrous leaves from alc., m. 179°; *o*-nitro derivative, yellowish, irregular crystals from alc., m. 137°; *p*-bromophenylsulfone-*o*-nitrophenylmethane, leaves from alc. or CHCl_3 , m. 137°; *m*-nitro derivative, microcryst. powder from alc. or CHCl_3 , m. 182°; *p*-nitro derivative, microcryst. powder from alc., m. 195°; *p*-amino derivative, yellow needles from alc., m. 187°; hydrochloride, lustrous crystals; *o*-amino derivative, leaves from alc.; hydrochloride, stout prismatic needles; *p*-hydroxy derivative, by diazotizing the NH_2 deriv., yellow crystals, m. 194.5°. *p*-Bromophenylsulfonenitromethane, $\text{BrC}_6\text{H}_4\text{SO}_2\text{CH}_2\text{NO}_2$, prepd. by warming $\text{p-C}_6\text{H}_4\text{SO}_2\text{Na}$, moistened with alc., with 1 mol. ClCH_2NO_2 , m. 161°, lustrous needles from alc. or CHCl_3 . The reactivity of its methylene H atoms is shown by its ready soly. in NaOH , and by the formation of a hydrazone with PhN_2Cl , golden needles from alc., m. 164°; with NaOH it forms a sodium salt, yellow needles. The following I compds. showed no acidic properties: *p*-iodophenylsulfone-*o*-nitrophenylmethane, lustrous leaves from alc., m. 129°; *m*-nitro derivative, leaves from alc., m. 218°; *p*-nitro derivative, brownish yellow needles, m. 223.5°. In an analogous way *p*-tolylsulfone-*m*-nitrophenylmethane was prepd., octahedrons from alc., m. 162°; *o*-nitro derivative, pale yellow, lustrous needles, m. 182°. $\text{p-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{CH}_2\text{Ph}$ was prepd. by oxidizing with KMnO_4 at room temp. the corresponding thio ether (cf. Kulenkampf, *Diss.*, Freiburg 1906), crystals from alc., m. 169°. Contrary to a previous report by Fromm and Wittmann, it was found that no methylation took place when heated with MeI and NaOEt . A similar behavior was observed in the case of the *m*-nitrophenylsulfonephenylmethane (B), lustrous yellow needles, m. 160°, prepd. by warming ClCH_2Ph with $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Na}$, the latter having been first prepd. from PhCH_2Cl and $\text{m-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Na}$ according to the method of Limpricht (cf. *Ann.* 278, 239(1894)). On reduction with Sn and concd. HCl , B gave the amino derivative, needle aggregates, m. 119.5°. Introduction of 2 NO_2 groups, one in the Ph and the other in the PhSO_2 , did not give to the following products reactive methylene H atoms; *m*-nitrophenylsulfone-*p*-nitrophenylmethane, brown tablets, m. 192°; the *o*-nitrophenylmethane, brown crystals from alc., m. 184°; *m*-nitrophenylmethane, pale yellow needles, m. 171°. As Knoevenagel has shown (cf. *Ber.* 21, 1344(1888)), AcCN cannot be directly alkylated, while in PhCH_2CN , and also in $\text{PhSO}_2\text{CH}_2\text{CN}$, the methylene H atoms are replaceable. On the other hand, $\text{PhSO}_2\text{CH}_2\text{Ph}$ is unreactive even after the introduction of a NO_2 in each of the Ph groups. As expected, very reactive were the methylene H atoms in *m*-nitrophenylsulfoneacetoneitrile, yellow leaves, m. 119.5-20°, prepd. by heating for 1 day at 130° finely powdered $\text{m-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Na}$ (moistened with alc.) with ClCH_2CN ; anisole derivative, $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{C}(\text{CH}_3)_2\text{CN}$, lustrous yellow needles, m. 160°; phenylhydrazone or azo derivative, $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{C}(\text{NNHPh})\text{CN}$ or $\text{O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{CH}(\text{NPh})\text{CN}$, reddish yellow needles, m. 175°, forms salts with bases.

D. BRÜSE JONES

Action of diazonium salts on arylsulfonated acetonitrile and propionitrile. J. TRÖGER AND E. WUNDERLICH. *J. prakt. Chem.* 101, 167-70 (1920).— $\text{RSO}_2\text{CH}_2\text{CN}$ (A) and $\text{RSO}_2\text{CHMeCN}$ (B) (R = aryl) show great differences in their behavior toward caustic alkalis, A derivs. being easily sol., while those of B are not. Both types, in the presence of concd. aq. AcONa , react in alc. with diazonium salts, A yielding true azo compds., $\text{RSO}_2\text{CH}(\text{N}:\text{NR})\text{CN}$, or more likely hydrazones, $\text{RSO}_2\text{C}(\text{N}:\text{NNHR})\text{CN}$, while B can yield only azo compds. These derivs. show the same different behavior toward bases as A and B; the derivs. of A form salts, while those of B do not. The salts of A could not be obtained in isomeric forms like those of $\text{PhN}:\text{NCH}(\text{CN})\text{COOR}$ (α - β -salts), and while the metal atom in salts of the latter can be easily replaced by alkyl groups, the same can be accomplished only with difficulty in the case of the derivs. of A. Expts. intended to det. whether the products formed by the action of diazonium salts on A and B derivs. were azo compds. or hydrazones, were unsuccessful. These products can be prep'd. in 2 ways: (1) by slowly adding the well cooled diazonium salt soln. to A in NaOH , and acidifying the reaction product with AcOH . This method, however, cannot be applied to derivs. of B on account of their insolv. in alkalis; (2) by adding the salt soln. to A or B in alc. containing a sat'd. aq. AcONa soln. This method gives purer products, and better yields also of the A derivs. *α -Naphthylsulfonephenylazoacetonitrile*, $\text{C}_{10}\text{H}_7\text{SO}_2\text{CH}(\text{N}:\text{NPh})\text{CN}$, or *α -naphthylsulfoneformylazide* *hydrazone*, $\text{C}_{10}\text{H}_7\text{SO}_2\text{C}(\text{N}:\text{NNHPh})\text{CN}$, was obtained as reddish yellow, hexagonal crystals, m. 203° . The following salts were prep'd.: *potassium* + $3\text{H}_2\text{O}$, golden crystals which lose H_2O at 105° ; *sodium*; *lead*, yellow amorphous ppt.; *silver*, canary ppt. Decompn. of the K salt with mineral acids did not yield 2 isomeric forms of the pseudo acid, as was obtained by Haller and others in the case of analogous azo compds. The corresponding *p*-tolylazo derivative, or the *hydrazone*, $\text{C}_9\text{H}_9\text{O}_2\text{N}_2\text{S}$, m. 193° , orange leaves from 90% alc.; *potassium salt* + $3\text{H}_2\text{O}$, lustrous golden leaves; *silver salt*, dark yellow amorphous powder. *α -Tolylazo derivative*, or *hydrazone*, dark yellow prismatic needles, m. $149-50^\circ$; *potassium salt*, yellow needles. *p*-Anisole derivative or *hydrazone*, $\text{C}_{10}\text{H}_{11}\text{O}_2\text{N}_2\text{S}$, prismatic, carmine needles from 90% alc., m. 173° ; *potassium salt* + H_2O , yellow hexagonal scales. *β -Naphthylsulfonephenylazoacetonitrile* or the corresponding *hydrazone*, prep'd. from $\beta\text{-C}_{10}\text{H}_7\text{SO}_2\text{CH}_2\text{CN}$ and $\text{PhN}:\text{NCl}$, m. $194-5^\circ$, stellar aggregates of red needles from dil. AcMe . It gave the following salts: *potassium* + $3\text{H}_2\text{O}$, lustrous, yellowish brown scales; *sodium*; *lead*, lemon ppt. The corresponding *p*-tolylazo derivative or *hydrazone*, m. $189-90^\circ$, orange needles from dil. AcMe ; *potassium* + $0.5\text{H}_2\text{O}$ (yellow ppt.), *sodium* and *silver* (dark yellow ppt.) salts. *m*-Tolylazo derivative or *hydrazone*, red prismatic needles from 90% alc., m. $160-1^\circ$; *potassium salt*, reddish yellow scales. *p*-Phenetole-azo derivative or *hydrazone*, brown whetstone-shaped crystals from 90% alc., m. $165-6^\circ$; *potassium salt* + $2\text{H}_2\text{O}$, yellow hexagonal scales. *p*-Bromophenylsulfonephenylazoacetonitrile or *hydrazone*, m. 185° , yellowish brown crystals from alc.; *sodium salt*, prep'd. from the calcd. amt. of AcONa in alc. and pptg. with Et_2O , yellow ppt., readily hydrolyzed by H_2O ; *p*-phenetole derivative or *hydrazone*, brown prismatic needles from alc., m. $164-5^\circ$; *sodium salt*, from AcONa in alc. *Phenylsulfonephenylazopropionitrile*, $\text{PhSO}_2\text{CMe}(\text{N}_2\text{Ph})\text{CN}$, canary needles from dil. alc., m. 78° ; *p*-tolylazo derivative, prismatic needles from dil. alc., m. $103-4^\circ$; *p*-anisole derivative, lemon needles from 90% alc., m. $81-2^\circ$; *p*-phenetole derivative, yellow crystals from alc., m. $96-7^\circ$. *β -Naphthylsulfonepropionitrile* (C), prep'd. by heating for several hrs. at $120-30^\circ$ $\alpha\text{-ClCHMeCN}$ + $\beta\text{-C}_{10}\text{H}_7\text{SO}_2\text{Na}$ in alc., white waxy scales from 80% alc., m. $90-1^\circ$. *β -Naphthylsulfonephenylazopropionitrile*, from C and PhN_2Cl , m. 120° , yellow tetrahedrons from 90% alc.; *p*-tolylazo derivative, dark yellow prisms from 90% alc., m. $119-20^\circ$. *p*-Chlorophenylsulfonephenylazopropionitrile, dark green rhombic scales from alc., m. $90-1^\circ$; *β -naphthylazo derivative*, pale yellow, silky needles from alc., m. $154-5^\circ$. *p*-Bromo-

phenylsulfone-*p*-tolylazopropionitrile, prismatic needles from alc., m. 151°; *p*-anisoleazo derivative, yellow prisms from alc., m. 153°.

D. BREMER JONES

Constituents of resins. VI. The amyirin of Manila-clemin resin. 1. Separation of the amyirin. ALDOIS ZINCKE, ALFRED FRIEDRICH AND ALEXANDER ROLLETT. Univ. Graz. *Monatsh.* 41, 253-70 (1920); cf. *C. A.* 14, 1312.—500 g. "Manila clemi optimum albissimum" were extd. with 96% alc. with shaking until the resinous part was completely in soln. and the crude amyirin then crystd. from Et₂O-EtOH. The test for resin acids was practically negative. The benzoates were fractionated with acetone, β -amyirin benzoate being insol. The sol. portion, carefully fractionated from AcOEt, gave α -amyirin benzoate, C₂₇H₄₄O₂, needles or broad prisms, m. 191°, sol. in Et₂O, CHCl₃, C₆H₆, CS₂, AcOEt, difficultly sol. in acetone, AcOH and alc. From concd. soln. it seps. with 1 mol. EtOAc as rhomboids, sol. in warm H₂SO₄ with citron-yellow color and green fluorescence, $[\alpha]_D^{20}$ 94.57°. *Bromo derivative*, C₂₇H₃₈O₂Br, long needles, m. 229°. α -Amyirin, C₂₆H₄₂O, by sapon. of the benzoate with MeOH-KOH by boiling for 5 hrs., needles, m. 183-4°. β -Amyirin benzoate, by crystg. the insol. portion above repeatedly from acetone, rectangular leaflets, m. 223-30°, $[\alpha]_D^{20}$ 100.2°, *n*_D²⁰ = 55.576:1. 1.789, β = 89° 54'. *Dibromo derivative*, C₂₇H₃₆O₂Br₂, fine needles, m. 211-2°. From alc. or dil. acetone, it crystals with 2H₂O, m. 180-5°. β -Amyirin, needles, m. 193-4°.

C. J. WEST

Synthesis of ephedrine, pseudo-ephedrine, their optical antipodes and racemic compound. ERNST SPÄTH AND RUDOLPH GÖHRING. Univ. Vienna. *Monatsh.* 41, 319-338 (1920).—Ephedrine and the pseudo compd. both have the structure PhCH(OH)·CHMeNHMe. This was synthesized by starting with EtCHO, which was transformed into 1,2-dibromo-1-methoxypropane (A), C₄H₉OBr₂, b₁₈ 66-7°, b₁₈ 71-2°, by treating 40 g. with 105 g. Br (1.5-2 hrs.) with cooling. 65 g. A in 300 cc. Et₂O are treated with the soln. of 60 g. PhBr, 10 g. Mg and 400 cc. abs. Et₂O, and after standing several hrs., the product is decompd. as usual and the Et₂O layer dried. 1-Phenyl-1-methoxy-2-bromopropane, C₁₀H₁₃OBr, b₁₈ 125-6°. 1-Phenyl-1-methoxy-2-methylaminopropane, C₁₀H₁₁NMe, results by the action of MeNH₂ in a sealed tube, 1 day at 30-40°, and 3 days at 100°; b₁₈ 105-10°. *Gold salt*, golden yellow, glistening leaflets, m. 116.5-7.5°. When heated with HBr in a sealed tube at 100°, *dl*-pseudoephedrine results, m. 117°. *Hydrochloride*, m. 164° (Eberhard, *C. A.* 10, 193, gives 180°). *Gold salt*, (C₁₀H₁₁ON)₂·HCl·HAuCl₄, m. 186-7° (Eberhard, 126°). The *dl*-compd. was resolved by means of tartaric acid. *l*-Pseudoephedrine *d*-tartrate, m. 178°. The *l*-tartrate, m. 178.5°. Upon liberating the base, *d*-pseudoephedrine was obtained, identical with the natural product. *l*-Pseudoephedrine, leaflets, m. 118-118.7°, $[\alpha]_D^{22.5}$ —52.50°. *Hydrochloride*, needles, m. 181.5-2.5°, $[\alpha]_D^{20}$ —62.1°. *Gold salt*, m. 126.5-7.5°. *Phenylthiourea*, m. 120-1°, $[\alpha]_D^{20}$ —23.1°. The synthetic *d*-pseudoephedrine was changed into *l*-ephedrine according to Schmidt (*C. A.* 2, 3348) and was found to be identical with the neutral product. Impure PhC(OMe)·CHMe was obtained in the prepn. of PhCH(OMe)CH(NHMe)Me, b₁₈ 75-85°.

C. J. WEST

The alkaline saponification of esters of symmetrical homologs of oxalic acid. ANTON SKRABAL AND ERNA SINGER. Univ. Graz. *Monatsh.* 41, 339-400 (1920); cf. *C. A.* 14, 1675.—The following figures give the values for *K*₁, *K*₂ and *N* = *K*₁/*K*₂ for the Et-esters: oxalate, 1.7 × 10⁹, 90, 19,000; malonate, 59, 0.88, 67; succinate (Me ester), 12.7, 2.7, 4.7; glutarate (Me ester), 21.6, 3.16, 6.8; Et ester, 10, 1.63, 6.1; suberate (Me ester), 1.53, 0.49, 3.1; azelate (Me ester), 1.24, 0.42, 2.95; sebacate (Me ester), 1.2, 0.43, 2.8. The alkyl substituted malonic esters show an abnormal behavior upon sapon. in that the value of *k*_∞ shows a very decided decrease with increasing time. The esters of the normal acids from oxalic to sebacic show, in concd. soln., a normal behavior; the reaction is a simple step reaction of the 2nd order. The ratio of the constants (*K*₁:*K*₂) is the greatest in the case of oxalic acid, but quickly falls and approaches

a limit of 2. These ratios are not independent of the concn., for in 1 and the same acid it becomes smaller with increasing concn., and approaches 2 as the limit. The first member of the series, even at the highest possible concn., is far distant from the limiting value 2, while in the case of the higher homologs it is practically reached.

C. J. Wxsr

Loturin. ERNST SPÄTH. Univ. Vienna. *Monatsh.* 41, 401-3(1920).—Loturin (Hess, *Ber.* 11, 1542) is identical with arabin and harman (Späth, *C. A.* 14, 1675); the conclusion is based on the similarity of the crystal forms of nitrates of the three, and on other physical properties.

C. J. Wxsr

The constitution of the polysaccharides. I. The relationship of inulin to fructose. JAMES COLQUHOUN IRVINE AND ETTIE STEWART STEELE. Univ. of St. Andrews. *J. Chem. Soc.* 117, 1474-89(1920).—A previous paper (*Biochem. Z.* 22, 357) has described the general method, used in this paper, of the use of methylation to det. the structure of di- and polysaccharides. I. and S. discuss briefly with references the general methods of detg. the structure of sugars. Results of exptl. work on the structure of inulin are described. Purified and dehydrated inulin, prepd. from dahlia tubers, has the formula $(C_6H_{10}O_5)_n$, is white, free from reducing action on Fehling solution, gives not over 0.2% ash on ignition, and is sol. in NaOH, $[\alpha]_D^{15} -34.21^\circ$ in H_2O . Dimethylinulin, prepd. by treating the NaOH soln. with Me_2SO_4 and purifying, is a brittle solid, sparingly sol. in cold H_2O , sol. to an opalescent soln. in hot H_2O , and reduces $KMnO_4$ rapidly, $[\alpha]_D^{15} -42.1^\circ$ in $CHCl_3$. Methylation of inulin does not proceed farther with Me_2SO_4 . Trimethylinulin, prepd. by further methylation of dimethylinulin with MeI and Ag_2O (2 mols.), is the limit of methylation for inulin; it is a colorless sirup at 10° , mixes freely with $EtOH$, $CHCl_3$, and acetone, sparingly sol. in Et_2O and H_2O , $[\alpha]_D^{15} 56^\circ$ in $CHCl_3$, 50.34° in $EtOH$. On hydrolysis of trimethylinulin with 1% $(CO_2H)_2$, trimethyl- γ -fructose is formed. This compd. is a viscid sirup, reduces $KMnO_4$ and Fehling soln. in the cold, and also $NH_3 \cdot AgNO_3$, $[\alpha]_D^{15} 30.51^\circ$ in H_2O , and 28.18° in $EtOH$. By treating trimethyl- γ -fructose with HCl in $MeOH$ at 30° for 9 hrs., trimethylmethylfructoside is prepd. This compd., on methylation with MeI (4 mols.) and Ag_2O (2 mols.) gives tetramethyl- γ -methylfructoside in 80% yield, colorless sirup, $n_D 134.5^\circ$, $n_D 1.4471$, reduces $KMnO_4$ vigorously, but not Fehling soln., $[\alpha] 20.98^\circ$ in $EtOH$. This fructoside, on hydrolysis in 0.25% HCl in H_2O , yields tetramethyl- γ -fructose, $[\alpha]_D^{15} 32.9^\circ$ in H_2O . On the basis of exptl. data, I. and S. conclude that inulin is an aggregate of γ -fructose residues, each ketose mol. having lost two OH groups in the formation of the polysaccharide. Diagrams are given showing the relationship between the compds. prepd., as well as structural formulas for anhydro- γ -fructose. **II. Conversion of cellulose into glucose.** JAMES COLQUHOUN IRVINE AND CHARLES WILLIAM SOUTAR. *Ibid* 1489-1500.—Present views regarding the structure of cellulose are not established, the most acceptable being that cellulose is a polyglucose anhydride, which may be interpreted either that the complex is a polymerized $C_6H_{10}O_4$ (derived from hexose by loss of water) or that it is formed by linking of hexose mols. with loss of water. The object of this paper is to show whether glucose is actually the hexose formed by hydrolysis of cellulose, and in what yield. Methods of acid hydrolysis are unsatisfactory. Ost's method (*Chem. Ztg.* 36, 1099; cf. *C. A.* 7, 3836) of using Ac_2O as the hydrolytic agent and isolating the acetates of the hexoses is much better. Up to the present, no method has given anywhere near the quant. yield, based on the wt. of sugar actually isolated. The method used in this paper involves hydrolysis and simultaneous formation of the Me glucosides to prevent further destructive action of the hydrolytic agent. Cellulose, cut into small pieces, is treated below 75° with a mixt. of Ac_2O and H_2SO_4 with stirring. The acetylated product is washed and the ppt. and filtrates are simultaneously hydrolyzed and methylated by methods described in detail. 65 g. cellulose gave 66 g. of Me glucoside, m. $125-154^\circ$, $[\alpha] 114.8^\circ$ (yield, 85%),

this was a mixt. of the α - and β - forms; it could be sepd. by crystg. from MeOH; in which the β -form is sol. Glucose was prepd. from the mixed glucosides, m. 145° (yield, 60%), and gave glucose phenylosazone, m. 204-5°. I. and S. conclude that cotton cellulose is composed essentially of glucose residues condensed together. It is possible that part of the 15% not converted into Me glucosides might be due to nuclei which form a ketose on hydrolysis, as the method would not show the presence of a ketose. Further work will include an attempt to discover the nature of this 15% loss.

J. B. BROWN

Formation and stability of spiro compounds. III. Spiro compounds from cyclopentane. OSCAR BECKER AND JOCELYN FIELD THORPE. *J. Chem. Soc.* 117, 1570-83 (1920).—Beesley, Ingold, and T. (C. A. 9, 3059) suggested that when a C forms part of a ring, the remaining two valences are distorted in a predictable manner. If 2β is the angle made by the first 2 valences (in the ring) and 2θ that between the remaining 2 valences, B. and T. now calc. that $\cos \theta = 1/4(\sqrt{\cos^2 \beta + 8} - \cos \beta)$. In the following the first value is 2β , the second 2θ : cyclopropane, 116° 55' 56", 60°; cyclobutane, 112° 58' 44", 90°; cyclopentane, 109° 46' 13", 108°; cyclohexane, 107° 14' 58", 120°; cycloheptane, 105° 16' 3", 128° 34' 17"; cyclooctane, 103° 40' 38", 135°. The values for C_6H_{10} are most nearly those for CH_4 ($2\beta = 2\theta = 109° 28' 16"$) and it is shown that $CH_3CH_2CH_2CH_2C(CH_2CO_2H)_2$ (A) more closely resembles $Me_2C(CH_2CO_2H)_2$ (B) than $CH_3CH_2CH_2CH_2C(CH_2CO_2H)_2$ (C) in reactions affecting the α -C atoms.

For instance, the di-Et ester of the α, α' -dibromo deriv. of C readily yields a bromolactone on distn. D and the corresponding deriv. of B do so much less readily. $(CH_3)_2C \cdot CH(CO_2H) \cdot CHCO_2H$ is not altered by concd. HCl at 240°. At 200°, 5% HCl con-

verts the corresponding derivs. of B and A (caronic acid and J) into terebic acid and decompn. products, resp. Further, F on treatment with alkali gives a little M, but this reaction in the cyclohexane series is much more complete. "The fact that groups can be eliminated more readily from the acetic acid residues in the C series than in the B series, and also the fact that the products formed by establishing a bond between these residues are more stable in the C series, are both fully in accord with the fact that these residues are closer together in the C series than in the B series, as the calcn. of 2β for the cyclohexane ring shows." A heated with PBr_3 and Br_2 and poured into abs. alc. gives diethyl α, α' -dibromocyclopentane-1,1-diacetate (D), colorless oil, b_{10} 211-12°. If the brominated product is poured instead into HCO_2H , the free acid (E) seps. in prisms m. 177°. Repeated distn. of D gives $\bar{E}tBr$ and the mixed *cis*- and *trans*-lactones of ethyl α -bromo- α' -hydroxycyclopentane-1,1-diacetate (F), colorless oil, b_{25} 220-2°. Hydrolysis of F by boiling 2 hrs. with 25% KOH gives a small yield of cyclopentylideneacetic acid, $(CH_3)_2C:CHCO_2H$ (M), m. 52°; the mother liquor, satd. with $(NH_4)_2SO_4$ and extd. with Et_2O , gives a gum which, after some months, solidifies and is the *trans*(?) lactonic acid of α, α' -dihydroxycyclopentane-1,1-diacetic acid, $(CH_3)_2C \cdot CH(CO_2H) \cdot O \cdot CO \cdot CH$

OH, colorless needles from C_4H_6 , m. 139-40°. With $AcCl$, A gives its anhydride, which with PBr_3 and Br_2 (followed by $EtOH$) yields diethyl α -bromocyclopentane-1,1-diacetate (G) as an oil b_{17} 192°, together with some of the monoethyl ester (H), undistillable oil, sepd. by extn. with Na_2CO_3 . Six hrs. boiling of H with 10% Na_2CO_3 forms the lactone of α -hydroxycyclopentane-1,1-diacetic acid, which b_{11} 228-30°, and on long standing gives crystals m. 69-70° after extn. with low-boiling ligroin; the lactone in dil. NH_4OH gives with $AgNO_3$ the disilver salt of the acid. When H (19 g.) was rapidly added to 60 g. KOH in 50 g. H_2O at 150°, the product was *trans*-cyclopentane-spiro-cyclopropane-1-2-dicarboxylic acid (J), colorless plates from H_2O , m. 211°; disilver salt, white

cryst. powder; *Hamilide*, silky needles from dil. alc., m. 289°; J can also be made from G. The mother liquors from J contain its *cis*-isomer (K), flattened needles, readily sol. in H₂O, m. 176°, best prepd. by the action of H₂O on its *anhydride* (L), obtained by distn. of J under reduced pressure. L, also formed from K and AcCl, is an oil, forming with 1 mol. PhNH₂ the *anilic acid*, m. 187°. J is unchanged by alk. KMnO₄, or by 5% HCl at 150°; at 200°, however, 5% HCl completely decomps. it in 1 hr., free C being formed.

BEN H. NICOLLET

Preparation of ethyl iodide. BEATRICE ELIZABETH A. HUNT. *J. Chem. Soc.* 177, 1592-4(1920).—H. verifies the statement of Beilstein and Rieth (*Ann.* 126, 250(1863)) that 1 atom of P reduces 5 atoms of I, instead of 3, as usually assumed. By using 80% EtOH instead of absolute, the red P may be added much more rapidly (50 g. in 20 mins., using 500 g. I) and the reaction completed by 2.5 hrs. refluxing. With these quantities a 92% yield was obtained.

BEN H. NICOLLET

Dependence of optical rotatory power on chemical constitution. III. 1,4-Naphthylenebisiminocamphor. BAWA KARTAR SINGH AND MAHAN SINGH. *J. Chem. Soc.* 117, 1599-1601(1920); cf. *C. A.* 14, 3402.—Camphorquinone (2 mols.), 1,4-C₈H₆(NH₂)₂·2HCl (1 mol.), and excess of NaOAc, heated 0.5 hr. at 60-70° and extd. with alc., gives red rectangular plates of 1,4-naphthalenebisiminocamphor (A), m. 228-9° (decompn.). "The narrower the mol. compass containing a given number of conjugated linkings, the higher the rotation," A being said to have the highest known [M]_D. Values obtained were: in CHCl₃, [M]_D^{18.1-8} 8157-96°; in MeOH, [M]_D^{18.4} 9052°; in EtOH, [M]_D^{18.4} 12,071-239°; in C₆H₆N, [M]_D²⁰ 13,416°. BEN H. NICOLLET

Formation of 2,3,6-trinitrotoluene in the nitration of toluene. ROYSTON BARRY DREW. *J. Chem. Soc.* 117, 1615-8(1920).—Notwithstanding the claim of Molinari and Giua (*C. A.* 8, 2948; cf. Brady and Taylor, *J. Chem. Soc.* 117, 867(1920)) 2,3,6-trinitrotoluene (A) has never been isolated from the direct nitration products of PhMe. As under usual nitration conditions there is formed about 4% of *m*-NO₂C₆H₄Me, which in turn gives about 50% of 2,3- and 2,5-dinitro products, each of which D. shows to yield about 15% A on further treatment, crude T. N. T. should contain ca. 0.3% of A. Nitration of 3,6-(NO₂)₂C₆H₃Me gave a crude product m. 95.4°, chiefly 3,4,6-(NO₂)₃-C₆H₃Me (B). The A present could not be isolated by simple recrystn., but on treating with N₂H₄·H₂O the B forms a red ppt. and allows the sepn. of A. The nitration of 2,3-(NO₂)₂C₆H₃Me gave similar results, the A being obtained in the same way. F. p. detns. showed about 15% A to be formed in each case. The easiest synthesis of A is as follows: trinitro-*m*-cresol is reduced with (NH₄)₂S in dil. MeOH to 3,4,2,6-HO(H₂N)-(O₂N)₂C₆H₂Me, which even when diazotized in hot alc. does not lose N₂. The product, apparently a diazo-oxide, when dissolved in HCO₂H and treated with Cu powder, gives N₂ and CO₂ and forms 3,2,6-HO(O₂N)₂C₆H₃Me (C), white crystals m. 133°. The ammonium salt of C, treated in alc. with 1 mol. alc. AgNO₃, gives the gray cryst. *silver salt*, which with MeI in alc. forms the *methyl ether* of C, white needles from alc., m. 115°. With alc. NH₃ at 130°, the Me ether yields 2,6-dinitro-*m*-toluidine, which is converted into A by the method of Körner and Contardi (*C. A.* 11, 1652). BEN H. NICOLLET

Hyenanchin and other constituents of Hyenanche globosa. THOMAS ANDERSON HENRY. Wellcome Laboratories. *J. Chem. Soc.* 117, 1619-25(1920).—*Hyenanche globosa* is an African plant from the fruits of which Henkel (*Arch. Pharm.* 144, 161 (855)) extd. a highly toxic sirup. Engelhardt (*Arch. pharm. Inst. Dorp.* 8, 5(1892)) isolated cryst. hyenanchin (A) and found it to be neither an alkaloid nor a glucoside. As A is reported to act on the brain like strychnine, without affecting the spinal cord, therapeutic value seemed possible. Stems (1 kg.), leaves (2 kg.) and fruits (4 kg.) were separately extd. with CHCl₃ and EtOH, the alc. ext. being worked up as usual. The fruits yielded 7.7 g. (0.19%) of cryst., bitter, toxic material, obtained from the stems

and leaves only in traces. Crystn. from 50 parts hot H_2O gave colorless needles (called isohyenanchin (B)) and on concn. short hexagonal prisms of A were obtained as the chief product. A, $C_{18}H_{18}O_7$, turns yellow above 200° and effervesces "sharply" at 234° ; it is sol. 1.18% in H_2O at 15° and slightly sol. in EtOH, BuOH, EtOAc and AcMe and has $[\alpha]_D^{15}$ 14.7° in H_2O . It reduces hot Fehling soln., warm $AgNO_3$ soln., and $KMnO_4$ and forms a yellow ppt. with Br_2-H_2O . Warmed with alkalis, a small amt. of substance distils, which may be acetole (semicarbazone, needles, m. 200° (decompn.)). A gave no derivs. with NH_2OH , PhN_2H_3 , or $NH_4CONHNH_2$. The somewhat difficult titration with $Ba(OH)_2$ showed two CO_2H groups. The soln. of the Ba salt deposits on evapn. $BaCO_3$, and yields another barium salt (probably $C_{18}H_{16}O_4Ba$) which, together with the corresponding acid, is a "water-sol. varnish." A is considered to be a dilactone. With Ac_2O and a drop of C_6H_5N at 100° , 3 products are formed, which m. 169° (decompn.), 126° , and 104° , resp. The second of these seems to be a monoacetyl derivative (B), $C_{18}H_{16}O_7$, turns brown at 245° and effervesces 299° ; it is sol. 0.26% in H_2O at 15° and less sol. in EtOH and EtOAc; $[\alpha]_D^{15}$ -61.3° in H_2O . It reduces hot Fehling soln. and cold NH_3-AgNO_3 . B seems also to contain two CO_2H groups, but the second equiv. of $Ba(OH)_2$ is absorbed less readily than by A. The physiological action of A is similar to, but much weaker than, that of picrotoxin. B is apparently non-toxic. Of the known isomers of A and B, picrotin, picrotin lactone, picrotoxic acid, and α - and β -picrotoxic acids are considered, and shown to be distinctly different. The $CHCl_3$ ext. of the leaves and stems gave a dark green wax, which on crystn. from EtOAc, gave 2 products. The first after distn. in vacuum formed small needles, m. $82-3^\circ$, of "hyenanche alcohol" (C), $C_{24}H_{40}OH$, readily sol. in $CHCl_3$, hot EtOAc, or EtOH, difficultly sol. in Et $_2$ O; acetyl derivative, colorless needles from Ac_2O , m. 75° . C is shown not to be identical with ceryl, myricyl, carnaubyl, or "wheat" alcs. The more sol. product from EtOAc was a new phytosterol (D), $C_{28}H_{48}O$, long needles, m. 265° , readily sol. in $CHCl_3$ or hot EtOAc, $[\alpha]_D^{15}$ -22.4° in $CHCl_3$. D gives an acetyl derivative, colorless needles from hot EtOAc, m. 244° . With concd. H_2SO_4 and Ac_2O , D also gives a typical phytosterol reaction. From the tannin fraction of the original alc. exts., boiling Et $_2$ O extd. a yellow coloring matter (E), $C_{15}H_{16}O_4$, tiny yellow needles, m. $270-80^\circ$ (decompn.); acetyl derivative, $C_{15}H_{14}O_5$, m. $234-6^\circ$ (decompn.). E appears to be a flavone deriv.; the 1 g. obtained precluded further work. BEN H. NICOLET

Benzoylation of some hydroxy or amino aromatic compounds. (Correction.) FRÉDÉRIC REVERDIN. *Helvetica Chim. Acta* 2, 729(1919); cf. C. A. 13, 313.—The paper referred to described the use of a little concd. H_2SO_4 to intensify the benzoylating action of $BzCl$. R. now cites cases in which others have used H_2SO_4 in connection with Bz_2O and $BzOH$. He still believes his own method to be new; but he does not wish to state this definitely. BEN H. NICOLET

The so-called true dibenzoylmethane of J. Wislicenus. CHARLES DUFRASSE. *Compt. rend.* 171, 1062-5(1920).—The compd. reported by Wislicenus (*Ann.* 308, 219-63(1899)) as having the structure CH_2Bz_2 was more probably $PhCH(OCH_2Bz)_2$,

derived from $PhCH:CBzBz$ instead of from $PhCBr:CHBz$ as W. supposed; for W.'s bromobenzylacetophenone yields with $NaOH$ a mixt. of $PhCH:CHBr$ and $BzONa$. Widmann (C. A. 10, 1526) offers his benzoylphenyloxidoethane as evidence supporting Wislicenus, but overlooks the probability that his and the earlier compd. are stereoisomeric. In general, the influence of the Bz radical on the addition of halogen acids is the same as that of the CO_2H group, the orientation of the halogen atom being β with respect to the Bz or CO_2H group. Thus, $PhCBr:CHBz$, m. 42° , is formed by addition of HBr to $PhC:CBz$, while $PhCH:CBzBz$, m. 44° , is formed by loss of HBr from $PhCHBrCHBrBz$. By addition of Br_2 the former yields $PhCBr_2CHBrBz$, m. $98-9^\circ$; the latter, $PhCHBrCBzBz$, m. $103-4^\circ$.

JULIAN F. SMITH

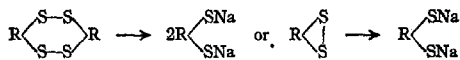
Study of the acid salts of monobasic acids: dibenzoates of potassium and lithium. PHILIPPE LANDRIEU. *Compt. rend.* 171, 1066-7(1920).—In the system $\text{BzOH-BzOK-H}_2\text{O}$, the acid salt BzOH.BzOK ppts., at a certain point on the concn. curve, as long needles without H_2O of crystn. Similarly, BzOH.BzOLi ppts., at a certain concn. in the system $\text{BzOH-BzOLi-H}_2\text{O}$, as brilliant plates without water of crystn.

JULIAN F. SMITH

Spectrochemical study of the α -allyl- and α -allylmethylcyclohexanones. R. CORNUBERT. *Compt. rend.* 171, 1060-2(1920); cf. *C. A.* 15, 670.—Since Haller (*C. A.* 7, 2386; 8, 658) and v. Auwers had shown that in this series the so-called "double groups," when composed only of Me radicals, are without appreciable influence on the mol. refraction, C. studied the variation of the latter when, starting with a ketone containing 2 Me double groups, the Me radicals are successively replaced by allyl. The compds. examd. were: α, α -dimethyl- α', α' -dimethylcyclohexanone (A), α, α -dimethyl- α', α' -methylallylcyclohexanone (B), α, α -dimethyl- α', α' -diallylcyclohexanone (C), α, α -methylallyl- α', α' -diallylcyclohexanone (D), and α, α -diallyl- α', α' -diallylcyclohexanone (E). B and C were not on hand and had to be prepd. for the purpose. B, obtained by dimethylation of the α -methylcyclohexanone followed by one allylation, is a liquid, b_D^{20} 106-7° (cor.), C, prepd. from dimethylcyclohexanone by diallylation, is also a liquid, b_D^{20} 128 (cor.). For the spectrochem. consts. of the 5 compds., measured at 23-5°, consult the original. C.'s observations support the theory of v. Auwers in regard to the influence of double groups on the value of the mol. refraction. A. T. FRASCATI

Constitution of thiofluorescein and its technical applications. TOSHIO MAKI. *J. Coll. Eng. Tokyo Imp. Univ.* 11, 1-38(1920).—M. has studied the mechanism of formation, properties, constitution, etc., of thiofluorescein (A) and thiogallein (B), its reduction product, which contains 2SH groups and bears a strong resemblance to gallein in many of its properties. The name *fluoresceindisulfide* is suggested for A, since it appears to be a disulfide deriv. of fluorescein (C), with the S atoms substituted in the 4- and 5-positions of the latter compd. The constitution of A as detd. by M. is quite different from that given to it by its discoverer, Wyler (cf. *Diss., Zürich, 1894*), who classed it as a *mono-S* deriv. of C with the S in the chromophore ring. A is found to be an acid color imparting yellowish orange shades to animal fibers, while B is an intense polygenetic mordant dye, fast to washing and light, particularly on wool. On this fiber, B gives the following shades: with Cr mordant, blue-black to black; with Al, dark red; with Fe, brownish black to black; with Sn, violet. (I) *Conditions of formation.* Several variations of Wyler's method for prep. A were tried. Of the 3 methods found to give good results, the following is representative: 1 mol. of C (Na salt) is heated to 120-5° with 10.5 mols. of NaOH, 7 g. atoms S and ca. 37 mols. H_2O . When 50-g. lots of C (free) were used, the reaction was complete in 1.5-2.0 hrs. No dye of the constitution of A could be obtained by the method given by Wichelhaus (*C. A.* 1, 1013) nor by that described in D. R. P. 114,268. M.'s expts. tend to show that the presence of a little free alkali and H_2O is essential. The action of these agents is explained as promoting the sulfurization by splitting open the chromophore ring. (II) *Manuf. of thiofluorescein.* Any of the methods referred to above, of which an example was cited, can be adapted for the manuf. of A. The fusion is carried out in an open vessel heated in an oil bath, the contents being constantly agitated. At the end of this operation, the fusion mass is dissolved in H_2O , acidified with dil. HCl and the ppt. filtered hot, washed and dried. A mixt. of A and free S is thus obtained. M. believes that the product obtained by Wyler and by Meyer (*Ber.* 33, 2581(1900)) also contained unchanged C through incomplete sulfurization, which would explain the green fluorescence noted by Meyer, while M. found it to possess no such property. (III) *Purification.* The method of purification used by the other 2 investigators referred to was found to be unsuitable; so M. devised the following: The crude A was dried, dissolved in dil. NH_4OH

and the excess NH_3 boiled off. The soln. of the NH_4 salt was dild. largely with H_2O and let stand in a cool place until all the S had been pptd. The soln. was then decanted, thrice filtered and A pptd. by adding dil. HCl . The dye was then filtered, washed and dried at 120° . To purify further from any residual S or unchanged C, extrn. with Et_2O can be used, the dye itself being insol. Still further purification for analytical purposes is described. (IV) *Properties and constitution*. Free A is a light brick-red, amorphous powder, insol. in H_2O , C_6H_6 , PhMe , CS_2 , CCl_4 and petrol. ether; difficultly sol. in Et_2O , CHCl_3 , AcOH and pure, dry Me_2CO . It is somewhat sol. in MeOH and EtOH , very easily so in Me_2CO containing 10-15% H_2O . Fluorescence is not shown in any case. The alkali salts of A (Na, K and NH_4) are cryst. powders with green or yellowish green, metallic luster. They dissolve readily in H_2O , forming scarlet-red solns. without fluorescence and are pptd. therefrom by adding alc. Contrary to Meyer, who stated that A m. ca. 220° (decompn.) M. finds that it has a higher m. or decompn. p. and is only darkened at 300° without decompn. The dye is stable towards alkalis and is hardly decompd. even when heated to ca. $130-40^\circ$ with concd. NaOH . It is sol. in concd. H_2SO_4 with brownish yellow color, and is pptd. unaltered on dild. with H_2O . Heated with H_2SO_4 to 200° , it resolves itself partly into C. A is not affected by dil. or concd. HCl even on boiling. Acetylation yields a slightly brown *acetyl derivative*, easily sol. in glacial AcOH and Me_2CO and readily sapond. by alkalis and concd. H_2SO_4 . Elementary analyses gave results which agreed very closely with the formula assumed for A by M., $\text{C}_{20}\text{H}_{12}\text{O}_5\text{S}_2$. The number of HO groups in A was found to be 2 by detg. the Ag in its Ag salt. A reacts with reducing agents, as Na_2S , NaSH , alk. $\text{Na}_2\text{S}_2\text{O}_4$ and others, giving a deep violet-blue soln., which is changed to red by air. As C does not react in this way, M. considers this as evidence that the 2 S atoms are present in the form of a disulfide and are changed to mercaptans on reduction:



Alk. KMnO_4 converts A into C and H_2SO_4 probably by first oxidizing it to fluorescein-disulfonic acid, which is then hydrolyzed into C and H_2SO_4 . From this reaction it is again concluded that the S atoms are attached as a disulfide and that A is a deriv. of C. Cold bromination of A in alc. produced only a slight amt. of C and H_2SO_4 , but no Br deriv. Hot bromination in the same solvent, however, gave eosin and ethyleosin but no Br deriv. containing S. The action of Br, therefore, appears to be similar to that of alk. KMnO_4 , eosin and ethyleosin being the products which would be expected after C has been formed in the soln. According to Matras (*Chem. Zig.* 19, 408(1895)) and Hewitt (*J. Chem. Soc.* 81, 893(1902)), the 4- and 5-positions of the C mols. are substituted first, then the 2- and 7-positions. The behavior of Br towards A thus strengthens the view that the S atoms are in the 4- and 5-positions since, were they still open, the Br deriv. of A should have been formed. Nitration of A with mixed acid resulted in a considerable quantity of C and a small amt. of a brownish black, cryst. compd. which was probably a *dinitrothiofluorescein* (D). Reduced with alk. $\text{Na}_2\text{S}_2\text{O}_4$, D gave a reddish purple soln., while on oxidation with alk. KMnO_4 it yielded a compd. consisting of light yellow needles, m. 113° (from alc.), corresponding to *4-nitroresorcinol* (E). D must, therefore, have been a *2,7-dinitro derivative*, which would be the product expected on nitration of C already substituted in the 4- and 5-positions. From the reactions described above, from theoretical reasons and from a study of the absorption spectra, M. concludes that A is 4,5-fluorescein disulfide and B the corresponding mercaptan. B is thought to have the quinoid structure even in its free state. The mechanism of the formation of A and its reactions are further explained graphically by means of structural formulas. (V) *Absorption spectra*. A study of the visible absorption spectra

of A, B and some related phthaleins afforded more proof of the great similarity in constitution of B and gallein and demonstrated that the 4,5- and 2,7-substituted fluoresceins could not be easily confused. (VI) *Dyeing*. Not only has A dyeing properties like its parent substance C, but it also possesses some of the properties of the S colors, being reduced by Na_2S , alk. $\text{Na}_2\text{S}_2\text{O}_4$, etc., and reoxidized by air and other mild oxidizing agents. Having 2 OH groups, it is sol. in alkalies and can be dyed on cotton as ordinary S colors. A is not a mordant dye, but B belongs to this class. Mordanted fibers are dyed in a slightly acid (AcOH) or neutral bath to which a little excess $\text{Na}_2\text{S}_2\text{O}_4$ has been added to prevent oxidation during the dyeing. Best results were obtained on wool both in respect to shades and fastness, while those on cotton were not so good. The shades on Sn and Fe mordants were rendered darker and much faster to light by after-treatment with CuSO_4 . The shades produced by B on wool are said to be deeper and faster than gallein on the same fiber. Complete directions for exptl. dyeing on the various mordants and 8 samples of the dyed material are included in the original paper.

A. T. FRASCATI

Preparation of esters by catalysis. A. MAILHE. *Caoutchouc & gutta-percha* 18, 10679-82(1921); cf. C. A. 14, 1305.—A number of esters were prepared by passing equal mol. quantities of acids and alcs. through a long glass tube, containing ZrO_2 as the catalyst, which was heated to the required temp. With one g.-mol. of the catalyst, and a speed of 60 cc. of a 1-1 mixt. of AcOH and EtOH, a transformation of 40% acid was effected; with twice the mass of catalyst, 55% was transformed. Increasing the ratio of alc. to acid and decreasing the vol. per hr. passed over the catalyst likewise increased the amt. transformed. ZrO_2 maintains its activity for a long time and the surface show no appreciable change. The interior of the catalyst becomes slightly gray but on ignition this becomes white, and its activity is completely restored. The action of ZrO_2 is equal to that of TiO_2 and better than that of ThO_2 .

JOHN B. TUTTLE

The velocity of the diazotization reaction as a contribution to the problem of substitution in the benzene nucleus. J. BOESEKEN, W. F. BRANDSMA AND H. A. J. SCHOUWISSEN. Tech. High School, Delft. *Proc. Acad. Sci. Amsterdam* 23, 249-66(1920); cf. C. A. 14, 1308.—This is a study of the problem whether a group already present decides the position of a newly introduced group or whether the nature of the new group plays the important role. The formation of *o*-, *m*- and *p*-derivs. probably depends upon the relative affinity of the reacting mol. for X in PhX and for H in the nucleus. Diazotization was used to measure the rate of reaction of a mol. entering group X, because the NH_2 directs to the *p*- and *o*-positions. Therefore, the rate will be more modified by groups already in *o*- and *p*-positions and less by groups in the *m*-position. The rate also depends on basicity, so independent basicity data had to be allowed for. The method of Tassilly (C. A. 8, 1042, 1565) was modified by: (1) maintaining considerable excess of HCl throughout and in every case the same; (2) when adding the Na salt of β -naphtholmonosulfonate (Schäffer's salt) having enough alkali to stop diazotization; (3) using a Wolff colorimeter. Procedure: To 100 cc. 0.01 *N* amine hydrochloride containing 5 cc. HCl (d. 1.19) per l. at 0° was added 400 cc. NaNO_2 (containing 0.001 g.-mol.) at 0°. 5-cc. samples were withdrawn and coupled at 0° with 5 cc. Schäffer's salt soln. (3 g. Schäffer's salt + 3 g. NaOH per l.). At the end of 3 hrs. no decompn. of diazonium compds. had taken place. From the colored solns. 5 cc. were withdrawn at short intervals and dild. to 500 cc. Assuming the 6-hr. sample to be 100%, its color was compared in a colorimeter with the shorter-time samples, giving directly the converted amine. It was found that: (1) the reaction was bimol. under these conditions, and (2) a group in PhNH_2 influences the diazotization velocity most if it is in the *o*-position in the *p*-compd. the influence is less, and in the *m*-deriv. it is feeble. Velocity const. ($= 100K$) where $K = (1/100x)[x/(100-x)]$ were found, to be

PhNH₂ 0.0965, *o*-MeC₆H₄NH₂ 0.0928, *p*-MeC₆H₄NH₂ 0.0687, *m*-MeC₆H₄NH₂ 0.137, *o*-IC₆H₄NH₂ 0.453, *p*-IC₆H₄NH₂ 0.151, *m*-IC₆H₄NH₂ 0.150, *o*-ClC₆H₄NH₂ 0.483, *p*-ClC₆H₄NH₂ 0.153, *m*-ClC₆H₄NH₂ 0.135, *o*-HO₂SC₆H₄NH₂ 0.966, *p*-HO₂SC₆H₄NH₂ 0.247, *m*-HO₂SC₆H₄NH₂ 0.107, *o*-BrC₆H₄NH₂ 0.450, *p*-BrC₆H₄NH₂ 0.129, *m*-BrC₆H₄NH₂ 0.142, *o*-HO₂CC₆H₄NH₂ 1.76, *p*-HO₂CC₆H₄NH₂ 0.521, *m*-HO₂CC₆H₄NH₂ 0.145, and 2,4-Me₂C₆H₃NH₂ 0.0886. All results are also plotted as time-% diazotization graphs.

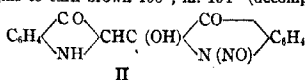
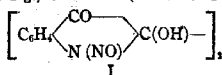
C. C. DAVIS

The preparation and technical uses of furfural. K. P. MONROE. *J. Ind. Eng. Chem.* 13, 133-5(1921).—By heating and subjecting to steam distn. a mixt. of 500 g. corn-cob adhesive, prepd. according to the method of LaForge and Hudson (*C. A.* 13, 83), with 150 cc. concd. H₂SO₄ and 500 cc. H₂O, 800 cc. of the distillate on fractional distn. gave 53 g. (26% of solid material in the adhesive) of furfural, b. 161.5-2°. With alkali sulfides and hydroxides furfural gives direct dyes; it condenses with phenols, giving resins similar to Bakelite; with PhNH₂ or with Me₂CO in the presence of alkalis it gives sol. resins. It is used as a solvent and insecticide. The article contains many references.

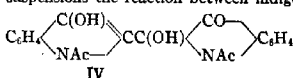
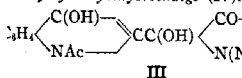
G. W. STRATTON

Action of nitrous gases on indigo. THEODOR POSNER and GÜNTHER ASCHERMANN. Univ. Greifswald. *Ber.* 53B, 1925-40(1920).—When 25 g. indigo suspended in 250 cc. of 96% alc. is treated with a vigorous current of nitrous gases (from As₂O₃ and concd. HNO₃), heat is evolved and the indigo quickly dissolves; the resulting clear yellow-brown liquid, evapd. on the H₂O bath and distd. *in vacuo*, yields (from 100 g. indigo) 53.5 g. of a light yellow oil, b₁₈ 130-42°, and 0.7 g. BzOH. The oil consists of Bz-CO₂Et, b₁₂ 138-9.2, b₇₅₆ 263.6-4.6°; 30 g. boiled 4 hrs. under a reflux with 300 cc. concd. HCl gives 14.4 g. of the free acid, b₁₂ 147-51°, crystals from Et₂O-petr. ether, m. 61-3°. If indigo is similarly treated in MeOH instead of EtOH and the action of the nitrous gases is not continued long enough, there remains undissolved a green-black powder which yields isatin to boiling MeOH, leaving unchanged indigo; the MeOH soln. on evapn. and pouring into H₂O gives *methyl benzoylformate*, yellow, almost odorless oil, b₁₂ 136.8-7.2°, b₇₅₆ 254.6-5.6°. In order to obtain, if possible, intermediate products and to clear up the mechanism of the above reaction, the action of nitrous gases on indigo was tried out in other solvents, and while the constitutions of the products described below have not yet been detd. with certainty and are given only provisionally, P. and A. believe that the conclusions as to the reaction mechanism which they have drawn from their study of these products must be very nearly correct. If indigo suspended in 12 parts Et₂O is treated with nitrous gases, considerable heat is evolved and the indigo is converted, without dissolving, into a dark yellow powder which, after standing some hrs. with frequent shaking, is filtered and carefully washed with Et₂O. The yellow powder so obtained (70-90% yield) is stable for some days if very carefully purified, but it is not advisable to keep it in dry state, for often it ignites spontaneously after a few hrs., at other times it slowly decomp. to a foamy putty-like mass which, after some days, again becomes solid and then with alc. gives the same product as the original crude substance (see below). Under pure Et₂O the substance is stable; it is insol. in Et₂O and C₆H₆, and is easily altered by almost all other solvents, so that it cannot be recrystd. It decomp. on gentle warming and dissolves in dil. alkalis and NH₄OH with dark brown color and decompn. It has the compn. C₁₆H₁₆O₄N₄H₂O and is in all probability *dinitrosodihydroxydihydroindigo* (I), and may have been produced by the nitrous gases first oxidizing the indigo to the hypothetical dihydroxyindigo, which is then nitrosated at both NH groups. The Et₂O mother liquors from I yield all the dissolved matter they contain to soda, but on acidification of the soda exts. there are obtained only tarry or amorphous brown to yellow ppts. from which no definite product could be isolated. If the Et₂O mother liquors are evapd. on the H₂O bath there is finally a stormy evolution of N oxides and CO and there remains a thick red

magma from which BzOH seps. overnight; distn. of the thick oil with steam yields BzOEt. If the I obtained from 25 g. indigo in 250 cc. Et₂O is covered with 150 cc. alc. immediately after it has been filtered and while it is still moist with Et₂O, there is a gentle evolution of heat and a vigorous liberation of N; the temp. is kept at 40–55° until the gas evolution ceases; there is a distinct odor of AcH and a bright cryst. powder seps. while the alc. becomes dark red-brown. The mixt. is heated to boiling for a short time, whereupon the crystals redissolve, filtered hot from unchanged indigo, cooled immediately with vigorous rubbing and allowed to stand 24 hrs. in the cold; there is thus obtained 3–3.5 g. *nitrosohydroxydihydroindigo* (II), crystals from EtOH (60 cc. for 1 g.) or MeOH (85 cc. for 1 g.), begins to turn brown 190°, m. 194° (decompn.),



mol. wt. in boiling alc. 325, can be crystd., with some caution, from glacial AcOH, easily sol. in dil. alkalis and NH₄OH, insol. in soda, pptd. by acids from alkalis in amorphous form. *Ammonium salt*, C₁₆H₁₁O₄N₄·2NH₃, from II in concd. NH₄OH, gradually decomp. above 140°, m. 168–70°, pptd. from H₂O by acids in flocks which redissolve on addition of alc. The alc. mother liquors from II leave, on evapn., crystals of isatin and a dark brown tar from which BzCO₂Et is obtained with steam. Similarly, when the I from 25 g. indigo in 300 cc. Et₂O is covered with 500 cc. MeOH and treated again for some time with nitrous gases there are obtained II and BzCO₂Me. Probably the I is first half denitrosated to mononitrosodihydroxydihydroindigo and this is then partly reduced to II and partly oxidized to isatin and a hypothetical *N*-nitrosoisatin, which takes up a mol. of alc. to form *o*-HON:NC₆H₄COCOR; this is then reduced by the alc. in the usual way to BzCO₂R. If the pure finely powdered II suspended in 20 parts MeOH carefully cooled is treated with nitrous gases it remains unchanged, but if the mixt. is not cooled it finally gives a clear red soln. from which BzCO₂Me is obtained in the usual way. When II is boiled with 10 parts glacial AcOH it dissolves and after a time evolves N oxides and deposits a yellow powder (14% of the II) which is filtered off, cooling hot after 3 hrs.; the filtrate on standing several days deposits yellow crystals 56% of the II) of a *monoacetyl derivative*, crystals from AcOH, darkens above 265°, m. 75–8°; since it dissolves easily in alkalis, it must be acetylated on the N and therefore probably has the structure III. The yellow powder insol. in AcOH is likewise insol. in all other solvents; it darkens above 310°, m. above 325°, is sol. in alkalis and is *diacetylhydroxydihydroindigo* (IV). In AcOH suspensions the reaction between indigo



and nitrous gases is more rapid than in the above cases; as the product is quite sensitive the mixt. should be moderately cooled during the reaction, the nitrosation interrupted as soon as the indigo has apparently all disappeared and a light green powder has sepd. and the product not allowed to stand longer than 2–3 hrs. in cold H₂O to complete the crystn. The product, the *diacetate* of I (yield, 60%), seps. from alc. as a light yellow cryst. powder, m. 172° (decompn.), is unstable, evolving after a time AcOH and nitrous gases and forming a mahogany-red powder. After boiling 0.5 hr. in alc., a considerable part seps. unchanged, but the mother liquors already contain appreciable amts. of isatin; after 20 hrs. boiling it is completely converted into isatin and BzCO₂Et. If the mixt. is boiled a few sec. in 60 cc. AcOH gives 1.3 g. II; if the boiling is continued a few min. there are obtained III and IV. Ten g. in 200 cc. Ac₂O and 10 g. NaOAc gently warmed, treated slowly with 50 g. Zn dust and boiled 2–3 hrs. gives 5 g. tetraacetyl-

indigo white, m. 256°. Isatin (10 g.) under 150 cc. alc. treated, with moderate cooling, with nitrous gases for 2 hrs. and allowed to stand 24 hrs., dissolves almost completely and yields BzCO_2Et . CHAS. A. ROBINSON

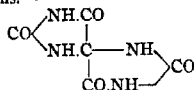
Uroxoic acid. HEINRICH BILTZ AND RUDOLF ROBT. Univ. Breslau. Ber. 53B, 1950-63(1920).—The present work fully confirms the structure of a) thureido-malonic acid, $(\text{H}_2\text{NCONH})_2\text{C}(\text{CO}_2\text{H})_2$, assigned by Behrend (C. A. 3, 1889) to uroxoic acid (A). Uric acid (30 g.) in 250 cc. H_2O and 58 g. KOH in 400 cc. H_2O treated at 38° with a slow current of CO_2 -free air for 18 days and concd. on the H_2O bath to 0.5 its vol. gave 16 g. of the K salt of A, $c(001)$, $m(110)$, $b(010)$, $o(111)$, $g(001)$, $a:b:c = 0.88576:1:1.2044$, $m:m$ $83^\circ 4'$, $c:o$ $61^\circ 10'$, $b:g$ $50^\circ 24'$. At room temp. (15°), the oxidation is much slower (70 days) and the yield is only 12%. With KMnO_4 , the reaction is much more rapid; 100 g. crude uric acid in 250 cc. H_2O and 200 g. KOH in 2 l. H_2O treated at 3° in the course of 1 hr. with 62 g. KMnO_4 in 1.4 l. H_2O , allowed to stand 4-5 hrs., filtered, concd. on the H_2O bath to 400 cc., again filtered, cooled and recrystd. from 180-200 cc. H_2O at 80-90° give 55 g. of the K salt. Careful detns. by slowly heating under 20-30 mm. up to 130-40° showed that it seps. with 3.5 H_2O , part of which it loses easily; after 60 hrs. over CaCl_2 it contains 16.5% H_2O instead of 17.5%; after a short time at 30-40°, 14.6%. The dehydration curve, detd. by allowing the salt to stand in open vessels at about 20°, shows that it slowly loses 0.5 H_2O (about 2 weeks), forming a trihydrate; other samples, heated (about 40° during the day, 20° at night) or kept in a desiccator over P_2O_5 , quickly lost 3 H_2O (4-7 days) and the remaining 0.5 mol. very slowly, indicating the formation of a hemihydrate. The free A is obtained easily and quant. by acidifying aq. solns. of the K salt; it seps. in star-like aggregates of small tetrahedrons, decomp. 162°, decomp. with evolution of CO_2 in H_2O at 60°, reddens litmus paper. The Na salt, hexagonal leaflets with 8 H_2O , can be obtained by oxidation of uric acid in NaOH, but the crude product contains much Na_2CO_3 and on recrystn. from 4 parts warm H_2O gives only 25 g. of the salt from 100 g. uric acid. Ammonium salt (4.7 g. from 5 g. A in 20 cc. of warm 2 N NH_4OH), prisms, turns yellow 172°, decomp. 182°. Silver salt (5.4 g. from 5 g. of the K salt in 40 cc. warm H_2O and 25 cc. of 20% AgNO_3), cryst. meal, slowly darkens in the air. A (5 g.) heated on the H_2O bath with 12 g. fuming HI, the liberated I being removed from time to time by addition of a little PH_4I , gives 1 g. hydantoin. When 3 g. A and 10 cc. H_2O are heated to 80°, CO_2 is evolved above 60°; after 10 min. the clear soln. is concd. to 5 cc., poured with shaking into 30 cc. dry alc. and 10 cc. Et_2O and allowed to stand 2 hrs. at 0°; there is thus obtained 1.1 g. "glyoxyurea" (B) as a snow-white powder after washing with dry alc. and Et_2O and drying *in vacuo* over H_2SO_4 ; the filtrate yields 0.9 g. urea nitrate. B easily absorbs H_2O , foams 120-5°, darkens about 180°; on reduction with HI, 1 g. gives 0.4 g. hydantoin. A detailed report on B will be given later. A (2 g.) and 10 cc. concd. HNO_3 evolve 21.5% CO_2 above 60° (calcd. for 1 mol. 20.0%) and yield 0.8 g. urea nitrate. A (1 g.) allowed to stand with 10 cc. of 2 N HCl and 20 cc. H_2O evolves after some days a very small amt. of CO_2 and completely dissolves only in 24 days; after some weeks more crystals sep. and on concn. in a vacuum desiccator to 10 cc. 0.1 g. allantoin is obtained. At 40° the allantoin is formed in 10 days. A (1.5 g.) dissolves in 30 cc. concd. HCl in about 2 hrs. with evolution of some CO_2 due to side reactions; after the gas evolution has ceased (about 12 hrs.) the soln. is concd. on the H_2O bath to about 5 cc., giving, on cooling, 0.1 g. spiro-dihydantoin (Ann. 413, 308(1916)). The above reactions of A might seem to indicate that it contains a 5-membered ring, but that a cyclic structure is untenable and that A contains two CO_2H groups is shown by the fact that when 2 g. A is covered with the Et_2O soln. of CH_3N_3 from 4 cc. $\text{MeN}(\text{NO})\text{CO}_2\text{Et}$ there is at once a vigorous evolution of N_2 ; when the soln. has become colorless the deposit is rubbed up and again covered with the same amt. of fresh CH_3N_3 soln.; after 12 hrs. there is obtained 2 g. of a product

which is freed from unchanged A by shaking 10 min. with 30 cc. H_2O at 80° , washed with H_2O , alc. and H_2O and dried at $40-50^\circ$. This gives 1 g. *dimethyl uroxanate*, decomp. 213° , Me (as MeO by the Zeisel method) 11.9–12.4%, slowly sapon. to A by 50% KOH; 2 g. in 100 cc. H_2O concd. on the H_2O bath to 10 cc. gives 0.8 g. *spiro-dihydantoin* and some B. The *spiro*-compd. was identified as the di-Ag salt and the *diammine-copper salt*, $C_8H_{10}O_4N_4[Cu(NH_3)_2]$ (0.4 g. from 0.4 g. of the *spiro*-dihydantoin in 10 cc. H_2O and a few drops concd. NH_4OH and 2 g. crystd. $CuSO_4$ in 10 cc. H_2O and concd. NH_4OH after 4 hrs.), light blue felted needles. The easy sapon. of the ester by eq. alkalis and its conversion into *spiro*-dihydantoin explain the failure of attempts to esterify A with $MeOH-HCl$ or alk. Me_2SO_4 . A further confirmation of the correctness of the Behrend formula for A is the greater reactivity of the N in its free urea residues as compared with cyclic N. Using an app. essentially like that described by H. Meyer (*Analyse und Konstitutionsermittlung organischer Verbindungen*, 2te Auflage, Springer 1919, p. 776), the weighed sample and about 1 g. solid $NaNO_2$ were placed in the bulb, the exit tube was filled with H_2O , the air displaced with CO_2 , 20 cc. of 40% $NaNO_2$ run in through the funnel, the funnel rinsed with 5 cc. H_2O and 2 N H_2SO_4 run in through the funnel in small portions. With this method it was found that cyclic N compds. (uric acid, urea glycol, uric acid Me hemiether, hydantoin, B, alloxanic acid) evolve no N, while the following compds. evolve the amts. of N (in number of atoms) indicated by the numbers following the names: $MeNH_2 \cdot HCl$ 1, glycocoll 1, leucine 1, urea 2, $H_2NCONMe_2$ 1, allantoinic acid 3–4, 1,3,7-trimethylpseudouric acid 1, $CO(NHMe)_2$ 0, 1,8-dimethylallantoin 0, allantoin 2, A 4, di-Me ester 4. For some reason not yet fully explained, some methylated allantoinis (3-methyl and 1,3,6-trimethyl), also urea derivs. with negative substituents (acetyl- and benzoylurea, allophanic esters, pseudouric acid, 5-methoxypseudouric acid) evolve no N. A (1 g.) with 10 cc. of 40% $NaNO_2$ slowly decompd. with 2 N H_2SO_4 , freed from the excess of HNO_3 with urea and of free H_2SO_4 with $NaOAc$ and treated with $PhNHNH_2$ gave 0.5 g. acid $PhNHNH_2$ mesoxalate phenylhydrazone, m. 150° (foaming), solidifies and m. again 183° .

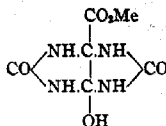
CHAS. A. ROULLER

Mechanism of the formation of uroxanic acid from uric acid. HEINRICH BILTZ AND FRITZ MAX. Breslau. *Ber.* 53B, 1964–6(1920).—In the production of uroxanic acid (A) by the alk. oxidation of uric acid there can hardly be any doubt that the oxidation takes place at the double bond in the 4,5-position of the uric acid. Behrend and Sundwik both assumed that uric acid 4,5-glycol (B) is an intermediate product, but when B was discovered all attempts to convert it into A failed; when dissolved in alkalis it loses its N in position 3 and yields caffolide. It has now been found, however, that when 5 g. of the di-Me ether (C) of B is heated 0.5 hr. on the H_2O bath with 7.5 g. KOH in 50 cc. H_2O and concd. *in vacuo* over H_2SO_4 it yields 1.2 g. of the K salt of A and further concn. and treatment with HCl gives 0.5 g. more of free A. Why only C and not B itself should give A cannot be said with certainty; possibly the spatial arrangement in B and in C is different. C is formed by the addition to the 4,5-double bond of uric acid of 2 MeO groups which are on the same side of the plane of the ring, while B, synthesized from alloxan and urea, is probably a *trans*-compd.; the corresponding *cis*-compd., which could be produced by oxidation of uric acid, has not yet been obtained. The further steps in the formation of A probably consist in a rearrangement whereby one of the two N atoms of the pyrimidine ring (in position 1 or 3) migrates to the central C atom in position 5, forming *spiro*-hydantoin (I) or Me hydroxyacetylene-diureinecarboxylate (II), resp., either of which, on hydrolytic cleavage, could give A. That I actually does so has been shown (C. A. 11, 2197); II is still unknown. Which is really formed cannot yet be said with certainty; some observations speak in favor of Behrend's view that II is the intermediate product. Just as uric acid, when oxidized in alk. soln. and the soln. is concd., gives A, while if the soln. is acidified with $AcOH$

before it is concd. it gives allantoin, so also C gives allantoin in good yield under the same conditions.



I



II

CHAS. A. ROULLER

Elucidation of oxonic acid. HEINRICH BILTZ AND RUDOLF ROBL. Univ. Breslau. *Ber.* 53B, 1967-83(1920).—It has been found that oxonic acid (A), discovered in 1871 by Strecker, whose results were published by Medicus (*Ann.* 175, 230(1875)), is identical with Mulder's allantoxanic acid (B) (*Ann.* 159, 365(1871)), and that S.'s "new acid from oxonic acid" (M.'s "glyoxylurea") is allantoxaldine (C). The acid K salt, $\text{C}_4\text{H}_2\text{O}_4\text{N}_3\text{K}$, of A, was obtained in 4.9-g. yield by S.'s method by passing air, washed with KOH, through 30 g. uric acid in 30 g. KOH and 500 cc. H_2O until acids no longer pptd. uric acid from the soln. (about 7 days), strongly acidifying with AcOH and adding some alc.; it seps. from H_2O in thin, very slender leaflets. The same salt is obtained very much more rapidly in 2.6 g. yield from 23 g. uric acid and 40 g. KOH in 250 cc. H_2O at 30-40° treated in the course of 1 hr. with 14 g. KMnO_4 , allowed to stand overnight, filtered and treated with 40 cc. alc. and then gradually with 80 cc. glacial AcOH. Both preps. were identical with the K salt of B, prepd. by oxidation of allantoin with alk. KMnO_4 (Sundwik, *Z. physiol. Chem.* 41, 343(1904)); all three dissolved to the extent of about 6% in boiling H_2O , sepd. in the same cryst. form, turned yellow about 260°, brown about 290°, decompd. about 362°. Free acid (1.6 g. from 2 g. of the acid K salt under 20 cc. of 10% HCl frequently stirred), flat tablets with 2 H_2O , m. about 261° (foaming), sol. in warm H_2O with decompn., insol. in org. solvents and hence cannot be recrystd.; the dehydration curve (over H_2SO_4) shows that no other hydrate than the dihydrate is formed. A reddens litmus paper. The Me ester, prepd. with CH_3N_3 , is a viscous sirup. Neutral K salt, $\text{C}_4\text{HO}_4\text{N}_3\text{K}_2 \cdot \text{H}_2\text{O}$, is obtained in 5.5-g. yield as needles from 5 g. of the acid salt in 25 cc. of 23% KOH and a few drops of alc.; Ponomarew (*Ber.* 11, 2156(1878)) states it seps. with 1 H_2O , while Medicus, who gives 1.5 H_2O , probably had the K salt of uroxic acid instead of A. Acid zinc salt, thin elongated tablets with 4 H_2O . Neutral Pb salt (cf. van Embden, *Ann.* 167, 41(1873)). Neutral Ag salt (1.2 g. from 1 g. of the acid K salt and AgOAc or AgNO_3). From 1 g. A in 10 cc. H_2O and 10 cc. H_2SO_4 treated with 1 g. KMnO_4 in 20 cc. H_2O is obtained 0.6 g. cyanuric acid. Ponomarew's synthesis of A (*Ber.* 18, 981(1885)) was fully confirmed; 3 g. parabanic acid and 3 g. urea were heated 2 hrs. at 125-30°, powdered and extd. with 300 cc. boiling H_2O , leaving 3.2 g. of a white amorphous powder, decomp. 229°, 0.5 g. of which, treated with 10 cc. of 30% KOH, dissolved with evolution of NH_3 , and on acidification in ice with AcOH yielded 0.2 g. of the acid K salt of A. Similarly, from 4 g. each of methylparabanic acid and urea is obtained 1.3 g. of an amorphous yellowish condensation product, decomp. about 200°, which with KOH and then AcOH yields a substance decomp. 135° (probably methyloxonic acid), forming a well crystd. K salt. There is no reaction, however, between dimethylparabanic acid and urea, $\text{H}_2\text{NCONHMe}$, $\text{CO}(\text{NHMe})_2$ or $\text{H}_2\text{NCONMe}_2$. C, stout prisms with 1 H_2O , m. 276° (decompn.), is obtained in 4.8-g. yield from 8 g. A in 20 cc. H_2O heated on the H_2O bath, vigorous evolution of CO_2 beginning at 40°; Ag salt (4.5 g. from 2.5 g. C in 40 cc. H_2O and 3 g. AgNO_3 in 20 cc. H_2O). S.'s analytical results for his "new acid" and its Ag salt agree well for C; his and Medicus' mistake resulted from their failure to analyze their products for N. Hydrazine salt, $\text{C}_4\text{H}_7\text{O}_4\text{N}_4$ (1 g. from 2 g. C and 4 g. $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$),

m. 204°; *phenylhydrazine salt* (1.2 g. from 0.5 g. C in 100 cc. of warm 10% AcOH and PhNHNH₂), light yellow leaflets, m. 228°, reduces Fehling soln. From 1 g. C, dried at 110°, powdered and covered with the Et₂O soln. of CH₃N₂ from 5 cc. MeN(NO)CO₂Et is obtained 0.7 g. of a *dimethylallantoxaldine*, short prisms from AcOEt, m. 158°, also obtained from the mono-Ag salt of C and MeI; both the groups are attached to N, for no MeI is evolved with HI. C (1 g.) heated on the H₂O bath with 5 cc. concd. HNO₃ and concd. yields 0.5 g. 1-nitrobiuret, decomps. 165°. C. A. ROUILLER

Phthalic anhydride derivatives. MAX PHILLIPS. *J. Ind. Eng. Chem.* 13, 247-9 (1921).—A partial list of names, with references, of compds. which can be made from phthalic anhydride. E. J. C.

Commemoration speech on Emil Fischer. BECKMANN. *Sitzber. preuss. Akad.* 1920, 698-703. E. J. C.

COHEN, JULIUS B.: **Organic Chemistry for Advanced Students.** Third Ed. Part I, 386 pp. Part II, 435. Part III, 378. London: Edward Arnold. 18s. each vol. For review see *Nature* 106, 627(1921).

TYTHERLEY, A. W.: **A Laboratory Course of Organic Chemistry, Including Qualitative Organic Analysis.** New York: D. Van Nostrand Co. 263 pp. \$2.50.

Benzonitrile and benzoic acid. F. A. STRAUSS. U. S. 1,367,898, Feb. 8. A mixt. of NaCN and PhSO₂Na is heated with sand (which moderates the exothermic reaction which ensues) to initiate a reaction between them with production of PhCN. The latter may be hydrolyzed for the manuf. of BzOH. The sand is preferably used in amt. about equal to 70% of the reaction mixt. Its presence increases the yield of nitrile by tending to prevent side reactions.

Acetic acid. BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., M. SOLLER AND J. HOTZ. Brit. 154,304, Aug. 21, 1919. In the manuf. of HOAc by the oxidation of liquid AcH the catalyst employed is kaolin, with or without the addition of NaOAc. The temp. is preferably maintained at 10-20°. If, instead of O, gas containing O be employed for the oxidation, it is introduced at a pressure up to 7 atms.

Acetic acid. H. MATHESON. Brit. 154,368, Sept. 9, 1919. The manuf. of HOAc by oxidizing liquid AcH by air under pressure in the presence of a catalyst, as described in 132,558 (*C. A.* 14, 287), is effected in a pressure vessel provided with a condenser kept at the same pressure, which refluxes condensed aldehyde back to the pressure vessel below the level of liquid therein. A suitable app. is specified.

Acetaldehyde from acetylene. CONSORTIUM FÜR ELEKTROCHEM. IND., GES. M. B. H. Norw. 30,948, Aug. 2, 1920. In the manuf. of AcH from C₂H₂ by means of acid Hg salt solns., ferrous salts are added to the reaction liquid.

Purifying the resinous reaction liquid in the manufacture of acetaldehyde from acetylene. DET NORSKE AKTIESELSKAB FOR ELEKTROKEMISK INDUSTRI, NORSK INDUSTRI-HYPOTEKBANK. Norw. 30,907, July 26, 1920. In the manuf. of AcH by conducting C₂H₂ into the acid soln. of a Hg compd., a resinous reaction liquid is obtained. This liquid is purified by treatment with blood- or bone-carbon.

Ethyl acetate from acetaldehyde. CONSORTIUM FÜR ELEKTROCHEM. IND. Norw. 30,906, July 26, 1920. The known process in which Al alcoholate is employed as catalyzer is modified by applying the catalyzer in a supercooled state to increase its efficiency. This form of the catalyzer is obtained either by rapidly cooling the molten alcoholate, or by dissolving therein other substances which do not affect its action.

Tropine derivatives. E. MERCK (Firm of), and O. WOLFFS. Brit. 153,917, Nov. 16, 1920. Tropinonecarboxylic ester is obtained by condensing together acetoacetic

ester, methylamine and succin-dialdehyde in well cooled aq. alk. soln. The product may be converted into ecgonine.

Tropine derivatives. E. MERCK (Firm of). Brit. 153,919, Nov. 16, 1920; cf. above. Tropinonecarboxylic ester is obtained by condensing together succinaldehyde, methylamine and acetonedicarboxylic acid ester or its salt in ice-cold aq. soln., CO_2 being eliminated.

Tropine derivatives. E. MERCK (Firm of). Brit. 153,918, Nov. 16, 1920. Addition to 153,919 (cf. above). Acetonedicarboxylic acid esters, for use in prepg. tropinone-carboxylic esters, are obtained by partial esterification of non-purified acetonedicarboxylic acid prepd. according to Pechmann, *Ann.* 261, 155 (1891).

Terpin hydrate. R. MARCHAND. Brit. 153,606, Nov. 10, 1920. Terpin hydrate is obtained from oil of turpentine or pinene by long and thorough agitation with a dil. acid, preferably H_2SO_4 , in an inert atm. such as one of N or CO_2 .

Terpineol. R. MARCHAND. Brit. 153,605, Nov. 10, 1920. Terpineol is prepd. by heating terpin hydrate with an org. sulfonic acid, preferably quinolinesulfonic acid. The process may be rendered continuous.

Saccharin. SOC. CHIMIQUE DES USINES DU RHÔNE, ANCIENNEMENT GILLIARD, P. MONNET ET CARTIER. Brit. 153,520, March 8, 1920. Saccharin is prepd. by oxidizing *o*-toluenesulfonamide with chromic acid mixed with H_2SO_4 of more than 35% strength. The chromic acid may be formed *in situ* by the use of a chromic acid salt. After the reaction mixt. is cooled and dild., the product is filtered off and the saccharin sepd. from unchanged starting material by any known method.

Saccharin. J. BEBIE. U. S. 1,366,349, Jan. 25. In the production of saccharin, *o*-toluenesulfonamide is oxidized with a mixt. formed from $\text{Na}_2\text{Cr}_2\text{O}_7$ dissolved in H_2SO_4 of at least 50% strength, at a temp. of 70° or lower. After cooling, the crude saccharin formed is filtered from the soln., washed and purified.

Esters. SOC. CHIMIQUE DES USINES DU RHÔNE ANCIENNEMENT GILLIARD, P. MONNET ET CARTIER. Brit. 153,827, March 2, 1920. Addition to 123,554 (C. A. 13, 2881). β -Dialkylaminoethyl-*p*-aminobenzoic alkyl esters are prepd. by the reaction of β -chloroethylalkylamines on *p*-aminobenzoic alkyl esters. Examples are given of the prepn. of $\text{Me}_2\text{NCH}_2\text{CH}_2\text{C}_6\text{H}_4\text{CO}_2\text{Bu}$ and of Me, Et, Pr, Bu, iso-Bu and iso-Am esters of $\text{Et}_2\text{NCH}_2\text{CH}_2\text{NHC}_6\text{H}_4\text{CO}_2\text{H}$. $\text{NH}_2\text{C}_6\text{H}_4\text{CO}_2\text{Bu}$ is prepd. by esterification of $\text{NH}_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$ with butyl alc., or by esterifying $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ with butyl alc. and reducing the product. Isoamyl *p*-aminobenzoate is prepd. by esterification of the acid with iso-AmOH.

Urea. NITRUM AKT.-GES. & H. SCHELLENBERG. Brit. 153,574, Oct. 25, 1920. Urea is obtained by treating CaNCN with HNO_3 in the presence of a strong soln. of $\text{Ca}(\text{NO}_3)_2$.

Urea. BADISCHE. Ger. 301,751, Nov. 30, 1916. In the manuf. of urea from NH_4 carbonates by heating under pressure, the deterioration of metallic, especially Fe, app. and app. parts, can be prevented by excluding O or excess NH_3 , or both, from the reaction mixt.

Urea. AKT.-GES. FÜR STICKSTOFFDÜNGER. Ger. 301,262, Mar. 22, 1916. Urea is obtained from CaNCN with the aid of solid catalyzers. The catalysis is effected directly in the slurry which is obtained by treating with CO_2 a suspension of CaNCN in H_2O .

Urea. AKT.-GES. FÜR STICKSTOFFDÜNGER. Ger. 301,263, Mar. 25, 1916. The production of urea from cyanamide is effected with the aid of solid catalyzers. The reducing substances, which reduce the activity of the catalyzers, are rendered ineffective before catalysis.

Evaporating urea solutions. AKT.-GES. FÜR STICKSTOFFDÜNGER. Ger. 299,132,

Mar. 19, 1916. The reaction of the urea solns. during the evapn. is maintained acid by the addition of weak acids or acid salts.

Carriers for catalytic materials. BARRETT Co. Brit. 153,877, Nov. 12, 1920. The carrier or support for a catalyst for the oxidation of organic compds. in the vapor phase is made of Al. The metal is melted and stirred while it cools to produce of a granular material with roughened surfaces, upon which the catalyst, e. g., V or Mo oxides, can be readily deposited in the usual way. The oxidation reactions mentioned are the production of *maleic acid* from benzene, of *anthraquinone* from anthracene, and of *phthalic acid* from naphthalene.

Separating organic gases or vapor. BAYER & Co. Ger. 310,092, Nov. 4, 1916. The sepn. of org. gases or vaporized org. substances from their mixts. with air or other difficultly or not at all absorbable gases, such as H₂, is effected by treating such mixts. with porous C (decolorizing C), and then driving out the absorbed org. substances with the aid of steam and heating.

11—BIOLOGICAL CHEMISTRY

HATTIE L. HEPT, EDGAR G. MILLER, JR., AND WILLIAM J. GIES

A—GENERAL

FRANK P. UNDERHILL

The nature of snake venom. G. BUGLIA. Pisa. *Arch. ital. biol.* 70, 77-92 (1920); cf. C. A. 14, 775.—Snake venom is thermostable. Warming causes the toxic action of aq. ext. of the bodies of young snakes ("cicche") and of the blood serum of adults to disappear, perhaps by causing adsorption of the toxic substance by the coagulating proteins. The toxicity can be restored by mechanical means (grinding in a mortar with quartz powder) or by tryptic digestion. Injection into an animal after such treatment produces irregularity and augmentation of frequency of respiration, lowering of blood pressure and rapid death.

A. T. CAMERON

Carbon dioxide content of barn air. M. F. HENDRY AND A. JOHNSON. Carnegie Nutrition Lab., Boston and New Hampshire Agr. Expt. Sta. *J. Agr. Research* 20, 405 (1920).—CO₂ was detd. in the air at the station barn at Durham, N. H., in order to det. its influence on respiration expts. in case of a leak in the respiration chamber. The % of CO₂ varied in different parts of the barn from 0.089 to 0.228%.

F. C. COOK

Charles Bouchard, 1837-1915. A. DESGREZ. *Rev. sci.* 58, 577-86 (1920).—An obituary.

E. J. C.

Colloid-chemical action of the salts of the rare earths and their relation to the flocculation of antibodies. R. DORR. Basel. *Kolloid-Z.* 27, 277-92 (1920).—Salts of the rare earths, Th, Ce, Pr and La, agglutinate suspensions of red-blood corpuscles, bacteria or spores of molds and give a ppt. with protein solns. whether the salt is in soln. as a colloid or as a non-hydrolyzed crystalloid and even in every dil. soln., (1 part Th(SO₄)₂ to 5000 to 10,000 parts reaction mixt.). The pptg. action is stronger the higher the valence of the rare earth and also varies with unknown characteristics of the rare earth as well as of the protein. These salts are toxic for plant and animal protoplasm; the toxicity varies with the nature of the cation and of the living cell, and is not due to simple protein pptn. which is reversible in excess of protein, while the poisoning is not. Spores of bacteria and molds are not poisoned because of their impermeable membrane; the ease with which they are agglutinated indicates agglutination to be a surface process. Protein pptn. by salts of the rare earths is prevented by an excess of either of the reaction components. There is a threshold value of salt concn. below which there is no pptn. and this varies in the different cations, being lowest for Th.

The ppt. consists of weak combinations of protein and salt, colloid-chemically inactive and easily reversible, dissolving quickly and completely in an excess of either component or of other rare earth salts. Analysis of the process with Loew's interferometer shows that the amt. of the ppt. depends not only on the relative concn., but also on the cation; Th gives a ppt. 3 times as great as that resulting from the use of 20 times the quantity of CeCl_3 . Immune pptn. resembles in many respects the protein pptn. by Ce and Th salts. It shows the same relation to concn. of the reaction components, is prevented by an excess of one component and is characterized by reversibility. Studied by means of the interferometer, the ppt. accounts for all of the material lost from soln. on mixing the components, whether it is immune pptn. or pptn. by a rare earth salt; therefore the assumption of fermentative processes of the protein antigen is unnecessary in the explanation of immune pptn.

H. I. MATTILL

Photochemistry of visual purple. II. The effect of temperature on the bleaching of visual purple by light. SELIG HECHT. Creighton Univ., Nebr., *J. Gen. Physiol.* **3**, 285-90(1921).—This is a continuation of research on visual purple (cf. *C. A.* **14**, 3681) in which it is shown that the temp. coeff. of bleaching is 1.00 over a range of 30° . The reaction is monomol., probably of a simple nature; it represents a true chem. reaction rather than a process of diffusion.

CHAS. H. RICHARDSON

The isoelectric point of red blood cells and its relation to agglutination. CALVIN B. COULTER. Hoagland Lab., Brooklyn, N. Y. *J. Gen. Physiol.* **3**, 309-23(1921).—The isoelec. point was detd. by the method of cataphoresis in a specially designed U-tube, in which the movement and agglutination of the blood cells could be measured and observed. The non-polarizable electrodes were of Zn rods bathed in ZnSO_4 soln.; the buffer solns. were of acetic acid-acetate or phosphate mixt. The blood cells were prepd. from defibrinated sheep blood washed in saline soln. and then in isotonic sucrose soln. H-ion was detd. colorimetrically on a known vol. of cells in sucrose soln. to which varying amts. of HCl were added and the values thus found were employed in making up the solns. for the study of cataphoresis. Sensitized blood cells were prepd. by adding approx. 50 hemolytic units of a high titer immune rabbit serum to the 10% suspension of cells in sucrose soln. and incubating 2 hrs. at 37° before use. The results of this investigation may be summarized as follows: The movement of normal and sensitized cells in the elec. field is a function of the H-ion concn.; the isoelec. point is at p_H 4.6. On the alk. side of the isoelec. point, the red blood cells carry the negative charge which increases with increasing alkalinity; on the acid side, the charge is positive, increasing with increased acidity. On the alk. side, the charge carried by sensitized blood cells is smaller and increases less rapidly with increased alkalinity than the charge of normal cells. Normal and sensitized cells combine chemically with inorg. ions; the isoelec. point is a turning point for this chem. behavior. The cells combine in larger amt. with H^+ and Cl^- on the acid than on the alk. side, but on the alk. side they combine with cation (Ba^{++}) in larger amt. than on the acid side. This behavior has been noted by Loeb for gelatin (cf. *C. A.* **13**, 848, 1479, 1597). The optimum p_H for agglutination of normal blood cells is 4.75, i. e., at the point at which they are least combined with anion or cation, but for sensitized blood cells, the optimum is p_H 5.3. This point may be connected with the optimum for the flocculation of the immune serum body.

CHAS. H. RICHARDSON

Resistance of the emulsin enzymes to prolonged action of methanol. MARC BRIDEL. *J. pharm. chim.* **22**, 323-7(1920).—Five-year contact of the emulsin of almonds with 70% MeOH failed to destroy the activity of its enzymes on β -glucosides, lactose and β -ethylgalactoside. However, its activity, when compared with that of fresh emulsin upon the same substances, is much diminished. The enzymes acting on lactose and β -ethylgalactoside seem to have resisted better than β -glucosidase.

S. WALDBOTT

BERTRAND, G. AND THOMAS, P.: *Practical Biological Chemistry*. Translated by H. A. Colwell. London: G. Bell and Sons, Ltd. 348 pp. 10s. 6d. For review see *Physiol. Abstracts* 5, 584(1921).

COLE, S. W.: *Practical Physiological Chemistry*. Sixth Ed. London: Simpkin, Marshall, Hamilton, Kent and Co. 405 pp. 16s. For review see *Nature*. 106, 595 (1921).

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MACLEOD, J. J. R., *et al.*: *Physiology and Biochemistry in Modern Medicine*. Third Ed. London: Henery Kimpton. 992 pp. 42s. For review see *Physiol. Abstracts* 5, 583(1921).

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A practical form of thermostat aquaria heated by electricity. O. WINGE. *Compt. rend. lab. Carlsberg* 14, No. 10, 1-4(1920). E. J. C.

Lactose—determination in milk by colorimetric method. R. G. OWEN AND ROTH GREGG. *Detroit Clin. Lab. J. Lab. Clin. Med.* 6, 220-1(1921).—The method is a modification of Folin's latest blood-sugar method (*C. A.* 14, 2353). Two standards of pure lactose were prepd., one containing 0.25 mg. per cc. and the other 0.35 mg. One cc. milk is treated with 2 cc. Na tungstate and 2 cc. $\frac{2}{3}$ N H₂SO₄. After 5 min. the mixt. is dild. to 100 and filtered. One cc. of the filtrate plus 1 cc. H₂O and 2 cc. each of the two standards are placed in 3 special sugar tubes. To each 2 cc. alk. Cu soln. is added and the tubes are placed for 6 min. in boiling water. Then 2 cc. Folin molybdate phosphate soln. is added and the mixts. are dild. to 25 cc. The unknown is compared in the colorimeter with the standard it most closely approximates.

E. R. LONG

Basal metabolism determinations. HENRY N. TIENEN. *J. Am. Med. Assoc.* 76, 86-8(1921).—Tests were made with the Benedict and with the Jones portable closed-circuit respiration app. Elaborate technical and physiol. details are given. The results "show the suitable clinical accuracy of either of the 2 portable closed-circuit respiration app. The Jones app., the most recent addition to the methods now in use for detg. basal metabolism, because of its compactness, relative simplicity and accuracy, is especially valuable for clinical use."

L. W. RIGGS

C—BACTERIOLOGY

A. K. HALLS

Cresol and substitutes for saponified cresol. II. The disinfectant value of pure aqueous solutions of cresol. E. HALLER. *Arb. Reichsgesund.* 52, 253-77(1920); cf. *C. A.* 14, 2008.—*m*-Cresol has higher disinfectant value than *o*- and *p*-. The optimum concn. against staphylococci and other bacteria is 1.0-1.25% in neutral aq. soln.

H. V. ATKINSON

Nutritive value of yeasts. K. W. JÖTTEN. *Arb. Reichsgesund.* 52, 339-74(1920).—Extracts of beer yeast can serve as a satisfactory protein food for bacteria. An extensive bibliography is appended.

H. V. ATKINSON

The purine bases of the tubercle bacillus. ESMOND R. LONG. *Saranac Lake, N. Y. Am. Rev. Tuberculosis* 4, 842-6(1921).—The purine bases guanine and adenine were isolated in pure form from two groups of human tubercle bacilli (H37), one grown on glycerol broth, the other on a simple medium containing NH_4Cl as the sole source of N. The amts. isolated were resp., 0.4% and 0.7% of the dry wt. of the organisms, from which it was calcd. that the nucleic acid content is between 2% and 3.5%, using the Levene and Jacobs formula, and assuming that the Kruger-Solomon method of purine isolation is approx. quant. Xanthine and hypoxanthine were absent, a fact which indicates that little autolysis had occurred during the 2 months of growth of the cultures, the purines present being those of the intact nucleic acid molecule. No purines were detected in the filtrate from the bacteria. The amino acids tyrosine and tryptophan were readily identified in the bacteria grown on NH_4Cl and glycerol. The total benzene-sol. material was 27.2%. The filtrate from these bacteria was a potent tuberculin, but failed to show the presence of dissolved protein by any of the characteristic color tests.

H. J. CORPER

Studies in the physiology of the fungi. XI. Bacterial inhibition by metabolic products. WILLIAM H. CHAMBERS. *Ann. Missouri Bot. Gardens* 7, 249-89(1920).—*Bacillus coli* was grown in plain bouillon and in dextrose bouillon at 30°. The changes in acidity were followed throughout the exptl. period. No evidence was obtained that metabolic products of the nature of autotoxins were formed. Inhibition was evident at p_{H} 5.5. An acidity of p_{H} 5.1-4.9 was lethal. Lethal acidity was not produced in 0.8% dextrose, but continued growth and a reversal of reaction occurred after max. acidity had been reached. Lethal acidity was produced in 0.4% dextrose. By adding dextrose at intervals to plain bouillon so that the p_{H} was kept at 6.0-7.0 excellent growth was obtained, and little inhibition was noted even in old cultures. Acidity, to p_{H} 4.9, due to added HCl, caused inhibition but was not lethal. Inhibition due to alkalinity begins at p_{H} 7.0-7.6, but greater alkalinity, to p_{H} 9.5, is not fatal. The inhibitory action of products of the metabolism of dextrose other than H ions is evident only near the critical acidity. *Bacillus aerogenes* is somewhat more resistant to acidity than is *B. coli*.

T. G. PHILLIPS

Titration curves of certain liquid culture media. JOANNE L. KARRER AND ROBERT W. WEBB. *Ann. Missouri Bot. Gardens* 7, 299-305(1920).—Titration tables and curves are given for the adjustment of the following media to various p_{H} values: beet decoction, Czapek's soln., peptone soln., Pfeffer's soln. and Richards' soln. In most cases 0.2 N KOH and HCl were used.

T. G. PHILLIPS

Elementary chemical and bacteriological aspects of the true reaction of culture media. W. C. COX AND C. B. WOOD. *Military Surgeon* (Dec. 1920), reprint, 1-32 pp. —This paper is a discussion of the fundamentals of chemistry as applied to the determination of the reaction of media. The paper begins with a treatment of normal and molar solutions, which is followed by a general discussion of ionization and electrolysis. The theories underlying the standardization and use of indicators are given and the methods used for determining the reaction of cultures in the Army Medical School are presented. These methods are the applications of the indicators devised by Clark and Lubs.

FRID W. TANNER

D—BOTANY

CARL L. ALSBERG

Measurement of the amount of water that seeds cause to become unfree and their water-soluble material. G. J. BOUYOUKOS AND M. M. MCCOOL. *Mich. Agr. Exp. Sta. J. Agr. Research* 20, 587-93(1921).—The same type of dilatometer and same procedure were used as in the previous study (cf. C. A. 11, 860). Fourteen kinds of seeds were tested. The amt. of H_2O absorbed and the quantity the seeds caused to

become unfree (failed to freeze at -3°) are given. The latter varies from 25 to 77%. Repeated freezing and thawing diminished the amt. of unfree H_2O in most seeds. F. P. depression and osmotic pressure of dry seeds showed a variation for the former from 0.28 to 1.18° . The great power seeds possess to absorb H_2O and to abstract it from soil is partly, if not largely, due to their tremendous internal osmotic pressure.

F. C. COOK

Chemical control of sugar beet fields. J. HAMOUS. *Listy Cukrovar* 38, 173-4 (1920).—Curves are given showing the increase in wt. and sugar content of the beet root during the growth of the plant.

JOHN M. KRNO

The nutritive value of the food reserve in cotyledons. B. M. DUGGAR. *Ann. Missouri Bot. Gardens* 7, 291-8 (1920).—Preliminary expts. with Canada field peas and corn indicate that storage cotyledons are more important for the development of the seedling than are endosperms. The cotyledons of the pea appear to be exhausted in less than 10 days. Attempts to substitute mineral solns. containing organic N for excized cotyledons were not entirely successful, though Na nucleinate gave fairly good results. The work is to be continued.

T. G. PHILLIPS

The use of "insoluble" salts in balanced solutions for seed plants. B. M. DUGGAR. *Ann. Missouri Bot. Gardens* 7, 307-27 (1920); cf. *C. A.* 14, 3263.—Excellent results were obtained by growing seedlings of wheat and corn in culture solns. in which many of the necessary ions were supplied by relatively insol. salts. NO_3 cannot be supplied in this way. Cultures giving very good results contained: (1) $CaSO_4$, $Mg_3(PO_4)_2$, "soluble ferric phosphate," KNO_3 . (2) $CaSO_4$, $MgNH_4PO_4$, "soluble ferric phosphate," KNO_3 . $MgNH_4PO_4$ is not a satisfactory source of N for the plants used.

T. G. P.

Some factors in evergreenness in the Puget Sound region. GEORGE B. RIGG. Univ. Washington. *Ecology* 2, 37-46 (1921).—Largely a review. New data are given which show that the ratio of starch to glucose in the leaves of *Arbutus menziesii* and *Stellaria media* is very low in winter and increases greatly in May.

T. G. P.

Seasonal changes and translocation of carbohydrate materials in fruit spurs and two-year-old seedlings of apple. SWARNA KUMER MITRA. Ohio State Univ. *Ohio J. Sci.* 21, 89-103 (1921).—Detns. of glucose, maltose, sucrose and starch were made at intervals of 2 weeks throughout the year. The changes in carbohydrates are correlated in part with such changes in acidity as are known to favor the activity of one or another of the enzymes amylase, maltase and invertase.

T. G. PHILLIPS

The differentiation of the leaf tissue fluids of ligneous and herbaceous plants with respect to osmotic concentration and electrical conductivity. J. ARTHUR HARRIS, ROSS AIKEN GORTNER AND JOHN V. LAWRENCE. Carnegie Inst., Washington, D. C. *J. Gen. Physiol.* 3, 343-5 (1921).—The detns. were made on plants from the north shore of Long Island, N. Y. The av. osmotic concn. of the leaf tissue fluids as measured by the f. p. lowering, Δ , for trees was 1.292, shrubs 1.177, trees and shrubs 1.217, and herbs 0.846; the sp. cond. (av. $K \times 10^6$) for trees was 11,213, shrubs 10,770, trees and shrubs 10,922, herbs 14,308; the av. $K/\Delta \times 10^6$ for trees was 9,092, shrubs 9,529, trees and shrubs 9,378, and herbs 17,674. Thus the value Δ for ligneous plants is approx. 30% higher than in herbaceous forms, the value K is distinctly higher in the herbaceous forms and the ratio K/Δ is about 90% higher in the herbaceous plants. The results lead the authors to believe "that the differentiation of ligneous and herbaceous plants with respect to the magnitude of their osmotic concns. is a general biological law." The results for cond. require confirmation in other regions. Such confirmatory investigations are now in progress. Cf. *C. A.* 10, 3092; 11, 2218; 15, 250.

CHAS. H. RICHARDSON

Assimilation of carbon dioxide by green plants. P. MAZÈ. *Compt. rend.* 171, 1391-8 (1920).—Leaves from 29 species of plants, representing common trees, shrubs

and garden vegetables, collected under various atm. conditions, were immediately distd. without the addition of water, and under a reduced pressure at a temp. of 60°. The condenser and receiver for the distillate were surrounded by melting ice and so arranged as to prevent the escape of any volatile substance. Most of the leaves gave EtOH, CH_3CHO , and HNO_3 . HCHO was not found in any of the distillates, but certain other substances not hitherto reported were found. Corn and bean leaves contained $\text{CH}_3\text{CHOH.CO.CH}_3$, elder leaves gave HCN and $\text{CH}_3\text{OH.CHO}$, poplar leaves yielded $\text{CH}_3\text{CHOH.CHO}$ and a substance which upon oxidation gave $\text{COOH.CH}_2\text{CH}_3$. The distillate furnished by poplar leaves darkened on addition of alkali. Corn and bean leaves contain no $\text{CH}_3\text{CHOH.CO.CH}_3$ in the morning, or on cold rainy days, but show increasing amts. under the continued action of sunshine. Bean leaves contain coumarin in the morning but not in the evening. L. W. RIGGS

Constituents of rhubarb leaves (MAUE) 12. Hydrocyanic acid in Sudan grass and its effect on cattle (SWANSON) 12.

HAAS, PAUL AND HILL, T. G.: An Introduction to the Chemistry of Plant Products. Vol. I. On the Nature and Significance of the Commoner Organic Compounds of Plants. 3rd Ed. New York: Longmans, Green & Co. 414 pp. \$5.50. For review see *Chem. Trade J.* 68, 121(1921); cf. *C. A.* 13, 2741.

THATCHER, ROSCOE W.: The Chemistry of Plant Life. New York: McGraw-Hill Book Co. 268 pp. \$3.

E—NUTRITION

PHILIP B. HAWK

NORMAL

Carrot extract in infant feeding. H. ARON AND S. SAMELSON. *Deut. med. Wochschr.* 46, 772-3(1920).—In a number of infants with horizontal weight curve the administration of an ext. of carrots, made commercially according to Aron's direction, was followed by a marked gain in wt. S. AMBERG

Further experiments for preservation of lemon-juice. P. W. BASSETT-SMITH. Royal Navy. *Lancet* 1920, II, 997-8; cf. *C. A.* 14, 2367.—Lemon juice will keep well in coned. juice or tablet form. Boiling for 5 mins. does not appreciably diminish the antiscorbutic property. Heating for $\frac{3}{4}$ hr. at 58° diminishes it to a more marked degree. The equiv. of 2.2 cc. in one animal gave complete protection; 4.4 cc. completely protected 3 out of 4. E. B. FINE

Investigations in beef production. I. Composition of steers at the various stages of growth and fattening. II. Relation of feed nutrients consumed to substances stored in the body during the various stages of growth and fattening. III. Nutrient requirements for beef production based on digestible nutrients. T. L. HAECKER. Univ. Minn., *Bull.* 193, 110 pp.(1920).—A study of the relation of feed consumed to the building of tissue and storing of fat in the body of beef-bred steers during the various 100-lb. stages of growth from birth to the time of slaughter, for the purpose of obtaining more economical production. The results are given in 54 tables. F. M. SCHERTZ

ABNORMAL

Experimental studies in diabetes. The internal pancreatic function in relation to body mass and metabolism. Series II. II. Changes in assimilation by alterations of body mass. FREDERICKS M. ALLEN. Rockefeller Inst. *Am. J. Med. Sci.* 161, 16-32 (1921).—The assimilative power of diabetic animals rises and falls inversely with the body wt. This change is not due merely to variations in either glycogen or protein, but is produced also by the feeding and deposit of a non-sugar-forming material (fat). When considerable masses of active tissue, especially muscle, are removed by amputation, the effects upon the assimilation are negligible compared with those of similar losses of wt. produced by undernutrition. It may therefore be concluded that the effects

of undernutrition are not due to a reduction of active protoplasm but rather to a reduction of food supplies and metabolism. Though there must necessarily be some relation between the mass of pancreas and the mass of body cells which it can supply with hormone, this research indicates a direct quant. participation of this hormone in the metabolism of matter, and furthermore in exogenous rather than endogenous metabolism. In other words, the pancreatic function is not appreciably spared when the same quantity of food is metabolized by a reduced number of cells, but rather when the same number of cells metabolize a reduced quantity of food materials. Undernutrition should be continued to the point of relieving the pancreatic function from overstrain revealed by the most delicate tests, particularly hyperglucemia. With extremely few exceptions in human patients the curve of rising tolerance intersects the curve of falling wt. at some level on which life can be maintained. The valid proof of a quant. relation between the internal pancreatic function and the total body wt. and metabolism is A.'s aim. Any theories of the nature of this function or of diabetes must take account of the fact that the islands of Langerhans are concerned not merely in the combustion of sugar or storage of glycogen but also in the maintenance of the general tissues and reserves. In some manner an increased supply of fat or formation of adipose tissue imposes a burden on the island function, and reduction of any kind of food or of the body wt. reduces the demand upon this function. This fact seems to indicate that the island hormone has both a catabolic and an anabolic role. As the diabetic deficiency is so much more prominent with regard to carbohydrate, it is possible that the function is directly related to this alone, and that other foods are concerned only indirectly through their influence upon carbohydrate metabolism, though this point remains unproved. Whether the relation be direct or indirect, the status of the pancreatic hormone in general metabolism and of the disturbance of general metabolism in diabetes is sufficiently important that treatment must be directed to it and is seldom successful if limited to restriction of carbohydrate alone. H. V. ATKINSON

HARROW, BENJAMIN: *Vitamines*. New York: E. P. Dutton & Co. 219 pp. \$2.50 net.

• F—PHYSIOLOGY

ANDREW HUNTER

Comparative studies on respiration. XIV. Antagonistic action of lanthanum as related to respiration. MATILDA MOLDENHAUER BROOKS. Harvard Univ. *J. Gen. Physiol.* 3, 337-45(1921).—The results of these studies with *Bacillus subtilis* are as follows: Concns. of $\text{La}(\text{NO}_3)_3$ up to 0.000025 *M* did not affect the rate of respiration; at 0.000006 *M* there is an increase in the rate, but at higher concns. (0.00005-1.0 *M*) the rate decreased again. There was a well indicated antagonism between $\text{La}(\text{NO}_3)_3$ and NaCl and a very slight antagonism between $\text{La}(\text{NO}_3)_3$ and CaCl_2 . The proportion of $\text{La}(\text{NO}_3)_3$ and NaCl at their max. antagonism is 0.2 parts of the former and 99.8 parts of the latter. Cf. *C. A.* 13, 2695; 14, 1354. CHAS. H. RICHARDSON

G—PATHOLOGY

H. GIDEON WELLS

The influence of protein food on increased blood pressure. HERMAN O. MOSENTHAL. *Am. J. Med. Sci.* 160, 808-15(1920).—In most instances a low protein diet continued for a period of a few weeks is without effect upon the blood pressure of cases of hypertension. H. V. ATKINSON

Foundry fever. E. ROST. *Arb. Reichsgesundh.* 52, 1-4(1920).—Expts. on animals and men indicate that Zn vapors in foundry gas are the cause of foundry fever. Zn was found in the urine and feces of workers. Foundry fever may be prevented by better ventilation. H. V. ATKINSON

Autolysis of normal serum. I. An accelerator for the activator of serum autolysis. S. YAMAKAWA AND K. OKUBO. Kaiserl. Univ. Sendai. *Tohoku J. Exp. Med.* 1, 83-95(1920).—Temps. above 30° or below 20° inhibit the activating influence of acetone in serum autolysis. The duration of the contact is also important. Traces of ketones and aromatic alcs. promote this action, although having no activating influence when acting alone. II. Influence of phenols on serum autolysis. *Ibid* 120-30.—The activating influence of phenol, resorcinol, pyrocatechol and pyragallol on the autolysis of normal serum is reported. Addition of toluene promotes phenol and also acetone activation. Addition of normal serum to the serum activated by phenol inactivates it completely even after the serum has been heated to 55° for 30 min., but a temp. of 60° or more annuls this property.

H. V. ATKINSON

Seven cases of essential pentosuria. P. J. CAMMIDGE AND H. A. H. HOWARD. London. *Brit. Med. J.* 1920, II, 777-9.—An account of detailed exams. of 5 cases where *D*-arabinose was the only sugar, of one in which glucose was also present in small amt., and of another in which was present also a small amt. of pseudo-fructose. One case where prolonged study was possible showed no increase of pentosuria after administration of lactose, and no decrease on a carbohydrate-free diet. Diminution of protein-intake lowered the output of pentose from 3.2 to 0.5 g. per day, the amt. increasing when the protein of the diet was increased. All the cases showed an excess of urobilin and high excretion of amino-acid N, a combination indicating defective functioning of the liver, and in the case where continuous observation was made, it was found that the output of pentose varied with the amt. of urobilin and amino-acid N excreted. Alimentary pentosuria is also associated with these factors. The conclusion is suggested that pentosuria is dependent upon defects in the functional activity of the liver.

A. T. CAMERON

Studies on immunity to tuberculosis. The results of virulent reinjection into tuberculin-reacting areas (skin) of tuberculous guinea pigs. ALLEN K. KRAUSE AND H. S. WILLIS. Johns Hopkins Hosp. and Univ. *Am. Rev. Tuberculosis* 4, 563-91 (1920).—If, because of an existing tuberculous infection, a guinea pig has acquired a given degree of allergy and immunity, both of these are reduced under the following conditions: They are reduced at the site of an inflammatory tuberculin reaction for at least four days after the application of tuberculin; they are more reduced by inflammatory tuberculin reactions at places which are within the lymphatic drainage area of tuberculous foci than at places not so situated; they are reduced to a greater extent shortly (1-2 days) after the application of tuberculin than later (4 days). The part played by the inflammation of the allergic reaction, considered purely by itself, remains undisclosed.

H. J. CORPER

A preliminary report of a study of the Goetsch test. R. McBRAYER. N. Carolina Sanatorium. *Am. Rev. Tuberculosis* 4, 616-9(1920).—A preliminary study on 5 normal persons, 20 cases of tuberculosis, 22 cases of tuberculosis with suspicious hyperthyroidism and 6 cases of tuberculosis with definite hyperthyroidism led to the consideration of the individual symptoms produced by the test in order to make the test more practical for the general practitioner. The points considered are systolic blood pressure, pulse rate, pulse regularity, respiratory rate, and pupillary changes.

H. J. CORPER

Studies on conglutination and on the variations of the conglutinin content of healthy and sick cows. H. V. JETTMAR. *Centr. Bakt. Parasitenk., Abt. I* 85, 221-3 (1920).—The article consists entirely of a summary of studies made on the above subject.

JULIAN H. LEWIS

The action of tuberculin on the water metabolism. ROBERT MEYER-BISCH. Univ. Strassburg. *Deut. Arch. klin. Med.* 134, 185-207(1920).—The injection of tuberculin into a tuberculous individual has a pronounced effect on the water meta-

bolism in that it produces a diuresis, an increase in the body wt. and a diln. of the proteins in the body. Before the injection of tuberculin the serum protein concn. is lower in the morning than in the evening, but it is reversed after injection. The action of tuberculin is the same as that of As except that tuberculin acts only on the tuberculous.

JULIAN H. LEWIS

Creatine and creatinine excretion in disease. ERNST CRISTOPH MEYER. Greifswald. *Deut. Arch. klin. Med.* 134, 219-40(1920).—In 3 cases of progressive muscular dystrophy there was a low creatinine-creatinine excretion. Creatine by mouth in one of these cases did not increase the excretion of creatinine nor creatine in the urine. Two cases of myotonia atrophica showed no creatinuria and a low total creatinine coeff. In amyotrophic lateral sclerosis, the result of a chronic anterior poliomyelitis, there was a high excretion of creatine and a low excretion of creatinine. The neural form of muscular atrophy (Charcot-Hoffmann) showed normal relations. In a case of post-diphtheritic polyneuritis there was no creatine excreted. In the stage of complete paralysis there was a high creatinine excretion. When the muscle began to regain its activity there was a low creatinine coeff. There was no difference in the excretion of creatinine between the chorea and the lethargic stage of encephalitis lethargica. A case of recent apoplexy showed much creatinine and then creatine in the urine. A case of transverse myelitis complicated with liver cirrhosis showed a normal creatinine coeff. with creatinuria; the creatinuria was the result of the cirrhosis. The changes in creatine and creatinine metabolism is evidence for the role of the muscles in creatine and creatinine formation. Four cases of pernicious anemia showed normal relations. In the cachexia of malignant tumors there is no creatinuria. In 2 cases, in which there was liver involvement there was a creatinuria. In fevers lasting a short time there is a high creatinine coeff. but no creatinuria. In the 2nd day of 3 cases of scarlet fever a creatinuria was found in comparison to typhoid which does not show creatinuria before the 9th day. In 2 cases of typhoid there was no creatinuria in spite of a fever of 40°. In diphtheria there is a creatinuria which in several cases lasted for 3 wks. even though there was no fever.

JULIAN H. LEWIS

The effect of *Streptococcus hemolyticus* infection on the reaction of the blood of rabbits. LESTER R. DRAGSTEDT. Rush Med. Coll., Chicago. *J. Infect. Dis.* 27, 452-9(1920).—The blood of normal rabbits is slightly more alk. than human blood. Exptl. *Streptococcus hemolyticus* infections in rabbits produce a relatively marked acidosis, the OH of the blood varying from 7.65, which is normal, to 7.3 in an extreme case. The development of acidosis in *Streptococcus hemolyticus* infections in rabbits does not in itself play an effectual role in the mechanism of resistance in inhibiting the growth of the organism.

JULIAN H. LEWIS

Agglutination in influenza. KIRSTEN UTHEIM. St. Louis, Mo. *J. Infect. Dis.* 27, 460-3(1920).—Of 30 strains of *B. influenzae* isolated from patients with influenza 11, or 36%, gave agglutination with the patient's serum. Seven of these occurred in uncomplicated influenza, and 4 in influenzal pneumonia. Of the remaining 19 negative cases, 10 had pneumonia. Of 30 strains only one was agglutinated by heterologous serum.

JULIAN H. LEWIS

Complement fixation in influenza with *Bacillus influenzae* antigens. J. V. COOKE. St. Louis, Mo. *J. Infect. Dis.* 27, 476-81(1920).—Complement-fixing antibodies can be demonstrated in the serum of a considerable number of older children and adults convalescent from influenza, by the use of *B. influenzae* antigens. These antibodies are much less constantly found in children from 1 to 5 years of age. No definite antigenic relationship could be detected between 16 strains of *B. influenzae* with the serum tested. The results indicate that the influenza bacillus is pathogenic and infects many, if not all, patients with influenza. The complement-fixation test cannot furnish sufficient

evidence, however, to justify the conclusion that *B. influenzae* is the sole etiologic agent in influenza.

JULIAN H. LEWIS

An improved method for the production of antimeningococcic and other serums. JOHN F. ANDERSON. New Brunswick, N. J. *J. Infect. Dis.* **27**, 482-9(1920).—A potent and well balanced antimeningococcic serum can be quickly and safely produced from the horse by the use of the method described. This involves the use of an antigen, given intravenously, prep'd. from washed, killed cultures of meningococci. The severe and even fatal reactions so frequently encountered in the horse after intravenous injections of bacteria are not a manifestation of anaphylaxis, but are due to the presence of a toxic substance in the material injected. This toxic material can be removed by centrifugation and washing, and its removal apparently does not reduce the antigenic properties of the emulsion. A reaction similar to that observed in horses can be produced in rabbits by a first injection of an emulsion of unwashed meningococci; this reaction has no relation to the no. of the injection in a series, the series of injection, the rate of injection, or whether live or dead organisms are given, but occurs when the injection is intravenous and unwashed cultures are used. Points to be noted carefully in the prep'n. of the antigen are: young cultures, washing the bacterial emulsion, straining the emulsion to remove large clumps and particles of mediums, prompt injection after washing, and slow injection. Horses can be quickly brought to a production point by the use of washed killed cultures followed at a later period by washed live cultures. The scheme of injection provides for 4 successive injections with a resting period of 3 days. The treatment is begun with killed cultures, changing to live organisms after the 4th series of injection. The av. time required to immunize a group of 18 horses to meningococci was 50.1 days; the shortest time was 44 days and the longest was 79 days. The av. time required to immunize a group of 49 horses to pneumococci was 46 days; the shortest was 34 days and the longest 56 days. The method is generally applicable to the production of bacterial antiserum.

JULIAN H. LEWIS

The effect of Röntgen ray and thorium X on pneumococcus and streptococcus infection in mice. H. J. CORPER. Denver, Colo. *J. Infect. Dis.* **27**, 491-8(1920).—Mice subjected to a single non-lethal exposure to the Röntgen ray, capable, however, of producing a leucopenia, or given a single non-fatal injection of Th X, also capable of causing leucopenia, and shortly afterward inoculated with pneumococci (4 types) and hemolytic streptococci, human and bovine, revealed an increased susceptibility to all of these organisms, as is indicated by the increased and earlier mortality among the treated animals and the earlier appearance in and longer persistence of the cocci in the blood, as compared with animals subjected only to inoculation. These observations are significant since they reveal a similar increased susceptibility of the mouse subjected to these manipulations to all the organisms tested and bear out the results of Winternitz and his co-workers, who used benzene and the pneumococcus, and Löwen, who used the Röntgen ray as a leucotoxic agent and staphylococci and pyocyanus, anthrax and typhoid bacilli as the infecting organisms. The tubercle bacillus, however, stands out distinctly from these acute microorganisms, in this respect, as noted by the author previously, as well as by Kellert and Weinberg, the course of tuberculosis in guinea-pigs being uninfluenced by the leucotoxic agents. The explanation for this difference is probably associated with the relatively greater importance of various immune processes and the defensive functions of the circulating leucocytes in the acute diseases than in chronic diseases like tuberculosis.

JULIAN H. LEWIS

The primary toxicity of certain preparations from tubercle bacilli for mice and guinea-pigs. H. J. CORPER AND MARY MOORE. Denver, Colo. *J. Infect. Dis.* **27**, 499-502(1920).—The antolyzate or water-lyzate prep'd. from tubercle bacilli, avirulent and virulent human and avirulent and virulent bovine bacilli, in proportion of 4 parts by vol. of bacilli to 10 of fluid, possesses no toxicity for mice when injected intraperi-

tonically in a single dose of 2 cc. or daily for 9 days in a dose of 1 cc., nor for guinea-pigs in a single intraperitoneal injection as large as 10 cc. JULIAN H. LEWIS

The transmission of specific immune bodies from the mother to the young. KATHERINE M. HOWELL AND HARRIET EBY. Nelson Morris Memorial Inst. for Med. Res., Chicago. *J. Infect. Dis.* 27, 550-6(1920).—There is considerable variation in the antibody content in the serum of rabbits. The agglutinin and complement-fixing antibodies appeared stable in the serum of one rabbit when they were compared with the immune bodies in other rabbits. Complement-fixing antibodies appear to be less stable than the other immune bodies studied and less readily transmitted to the young. The results of these expts. do not indicate whether the young receive a passive immunity from the immune mother or whether they receive antibodies from the mother's milk. After parturition there was a marked decrease in the antibody content of the serum of the immunized rabbits, and this suggests a possible cause for the many post-partum infections. The offspring of immune rabbits, as a rule, have antibodies in their serum which persist in appreciable but decreasing amts. for 4 to 6 wks.

JULIAN H. LEWIS

Blood changes and antibody production in human beings after injection of pneumococcus lipovaccine. KATHERINE M. HOWELL. Chicago. *J. Infect. Dis.* 27, 557-64 (1920).—Agglutinins, complement-fixing bodies, and protective bodies for pneumococcus types 1, 2 and 3 are demonstrable in the serum of individuals vaccinated with pneumococcus lipovaccine. These antibodies appear in the serum rather late and are present to some degree for at least 1 yr.

JULIAN H. LEWIS

The production by *Streptococcus hemolyticus* of an agglutinin for red corpuscles which inhibits hemolysis. KATHERINE M. HOWELL. Chicago. *J. Infect. Dis.* 27, 565-8(1920).—The streptococcus studied was isolated from a vegetative lesion of the heart valves and appeared to be a typical *Streptococcus hemolyticus* when it was cultivated on blood-agar medium, but it had the peculiar quality of agglutinating instead of laking red blood cells when it was grown in broth medium. It seems possible that, on the blood-agar cultures, agglutination of the corpuscles was prevented by the mechanical factor of the solid medium and that accordingly hemolysis took place as usual. The tests noted suggest that the agglutinin for red blood corpuscles was an exogenous product of the bacterial cell and that hemolysin was probably present, but that its action on corpuscles, for some reason not detd., was inhibited by the agglutinin present. Agglutinin production was a transient quality of this streptococcus strain, since it was present in an appreciable amt. for only 6 wks.

JULIAN H. LEWIS

A comparison of antigens for bacterial complement fixation. KATHERINE M. HOWELL AND RUTH ANDERSON. Chicago. *J. Infect. Dis.* 27, 569-75(1920).—In summing up it appears that a bacterial suspension is at least as satisfactory as any other one antigen. It was not anticomplementary in small quantities; the antigenic unit was better than that of other antigens for streptococcus and typhoid; and it ranked second for meningococcus and ranked fourth for pneumococcus. The antigenic range was good, since even in the pneumococcus test there was complete fixation in 3 dilns. It, like the other antigens, in low dilns. of the anticomplementary unit, gave nonsp. reactions with certain serums, but the antigenic range was wide enough so that there was marked difference between these reactions and fixation with homologous immune serum. The antigen made by autolyzing by repeated freezing and thawing was the most satisfactory of the antigen preps. for the meningococcus test, and the antigen prep'd. by autolyzing in distd. H₂O with heat and that which consisted of a suspension of lipoids from the bacteria were the best for the pneumococcus test. The author suggests that since there is such diversity in the choice of the most satisfactory bacterial antigens for these 4 bacteria, and since the bacterial antigenic factor has not been detd., it would seem advisable before starting an extended bacterial complement-fixation

study, as a preliminary, to det. the antigen best suited for the bacteria used in that test.

JULIAN H. LEWIS

The action of certain salts on phagocytosis and virulence of streptococci. TORASABURO OTSUBO. John McCormick Inst. for Infect. Dis., Chicago. *J. Infect. Dis.* 28, 18-26 (1921).—Phagocytosis of streptococci in the peritoneal cavity of the mouse is diminished by $M/8$ solns. of certain salts ($MgSO_4$, $MgCl_2$, $SrCl_2$, Na_2CO_3 , $Na_2C_2H_3O_7$, and $CaCl_2$). KI and KBr inhibit in lesser degree. Higher dilns. of these salts seem to have no stimulating effect on phagocytosis *in vitro* or *in vivo*. As the diln. increases the inhibitory power is lessened. Repeated injections of some of the salt solns. used appear to reduce phagocytosis in the peritoneal cavity, but no stimulating effect was obtained by subcutaneous injection of higher dilns. of the salts in question. The results were the same in normal and immunized guinea pigs. Repeated subcutaneous injections of certain salts reduced the alkalinity of the blood and also the phagocytic power of the peritoneal exudate. Fewer leucocytes appear in the peritoneal cavity 3 hrs. after the injection of $M/8$ solns. of $MgSO_4$, etc., than after the injection of normal salt soln. When solns. of certain salts are injected together with streptococcus suspension in mice and the procedure is repeated through many successive passages, some salts may have a greater influence on the character of the streptococcus than others. Thus $Na_2C_2H_3O_7$ seemed to favor the development of virulence, to reduce agglutinability and phagocytibility as well as the power to elaborate lysin, but it had no special effect on the power to ferment sugars.

JULIAN H. LEWIS

Ocular reactions in anaphylaxis. RYNZO KODAMA. John McCormick Inst. for Infect. Dis., Chicago. *J. Infect. Dis.* 28, 48-61 (1921).—In anaphylactic shock there is a primary dilation of the lid and pupil of the eye followed by a secondary contraction. These effects on the smooth muscles of the lid and iris of guinea pigs suggest that the anaphylactic action involves the ends of both the true and parasympathetic nerve fibers on both sets of plain muscles in the lid and the iris. In addition to these phenomena, anaphylactic intoxication with horse serum may be associated with more or less marked circulatory disturbances, with edema and congestion of lid, conjunctiva, iris and ocular fundus, hemorrhages of epibulbar and retinal vessels. There may be a hypersecretion of the lacrimal and Harderian glands, especially on local application in the sensitized animal; this effect may be the result of the hyperemia, but direct stimulation of the glands and their nerves is not excluded. As all the anaphylactic eye phenomena—stimulation of plain muscles, circulatory disturbances and hypersecretion of eye glands—appear to be an intensification of the reaction that follows the application of horse serum to the normal eye, it may be assumed that the normal guinea-pig possesses small quantities of the antisubstances necessary for the anaphylactic reaction.

J. H. LEWIS

A simple method for the removal of natural amboceptor from human sera. R. L. KARN. Mich. Dept. of Health, Lansing. *J. Lab. Clin. Med.* 6, 218-20 (1921).—As soon as the serum tubes are taken from the inactivating bath a small drop of packed sheep cells is added to each. After 10 min. extn. the cells are centrifuged out and the supernatant liquid is poured into the tubes used for the (Wassermann) test. The natural antisheep amboceptor is totally removed. Expt. showed that such treatment would remove 160 units in 5 min. If the extn. is limited to 10 min. the treatment does not develop anticomplementary properties in the serum. In routine work where a large no. of tests is being run the delay introduced by this modification of the test is insignificant.

E. R. LONG

Mechanism of the Bordet-Wassermann reaction. W. KOPACZEWSKI. *Compt. rend. 171*, 1170-2 (1920).—Expts. by the author's method (cf. *Compt. rend. soc. biol.* 81, 590) indicate that the modifications of the elec. charge and the surface tension are

sufficient to account for the phenomena observed in the Bordet-Wassermann reaction.

L. W. RIGGS

Precautions necessary in the selection of a donor for blood transfusion. LESTER J. DUNN. *J. Am. Med. Assoc.* 76, 9-11(1921).—The following summary is given: Four groups of individuals may be established by the presence of 2 "chief" agglutinins in the serums and receptors for these agglutinins in the cells. "Minor" agglutinins have been demonstrated. With adults, 97% have agglutinins in their serums, but only 13% of new-born infants. Only 25% of new-born infants have cells that can be agglutinated, as compared with 50% among adults. The full quota of agglutinins and receptors is acquired between the 3rd and 4th years. Incompatibility between the blood of a mother and her new-born infant occasionally occurs. The blood should always be tested before transfusion even though the mother should act as donor. It is not safe to use the so-called "universal donor," as severe reactions have followed the use of donors of Group IV for the patients of the other groups. Group IV serum agglutinates all other corpuscles, while its own corpuscles are not agglutinated by any serum. The rouleaux-formation substance, even though acting on the donor's cells, is apparently harmless. It is unsafe to perform a transfusion, relying simply on the fact that the donor and patient are of the same group. Before transfusion the blood of every patient should be grouped and then tested directly against that of the prospective donor.

L. W. RIGGS

Fundamental classification of disease by the basal metabolic rate. WALTER M. BOOTHBY. *J. Am. Med. Assoc.* 76, 84-6(1921).—The following summary is given: The basal metabolic rate is a measure of the heat production in a person under standard conditions. Like the temp., the metabolic rate is a measure of certain heat phenomena inherent in the living organism. This rate differentiates diseases into 3 fundamentally distinct groups, viz., those with normal, decreased and increased metabolic rates. The "normal" standard of the basal metabolic rate is not exact, yet the comparatively small "normal" variation, compared to the wide range of pathologic variation, admits of fully as accurate grouping of diseases as does the body temp. It is to be hoped that the value of basal metabolic rates will not be discredited by carelessness in technic and a failure to appreciate the necessity for carrying out all the technical and physiol. details requisite for obtaining accurate basal metabolic rates.

L. W. RIGGS

Lithiasis pancreatica with four original cases. ERICH MÖCKEL. *Path. Inst., Leipzig Univ. Frankfurter Z. Path.* 24, 78-108(1920).—The stones were found throughout the entire pancreas in all the cases described by Möckel, and were all light colored. On chemical analysis they were found to be composed of $\text{Ca}_3(\text{PO}_4)_2$, 72.30%, CaCO_3 , 18.9%, org. material 8.80%. Different figures are given by other investigators. In 2 of the cases there was a marked diabetes but in the other 2 cases no sugar was to be found in the urine.

ELIZABETH PAULINE WOLF

I—ZOOLOGY

Experimental production of gigantism by feeding the anterior lobe of the hypophysis. EDUARD UHLENHUTH. *Rockefeller Inst. J. Gen. Physiol.* 3, 347-65(1921).—Salamanders of two species, *Ambystoma opacum* and *A. tigrinum*, were fed exclusively on the anterior lobe of the hypophysis of cattle, resulting in the production of giant individuals. Controls were fed only earthworms, which food has proven better for growth than several others tried; controls were much smaller than the hypophysis-fed individuals. It was noted that growth did not cease after the normal max. size for the species was attained, but was maintained beyond this point. It seems probable that gigantism was produced as a result of a sp. growth-promoting hormone contained in the anterior lobe of the hypophysis. Since the salamanders were

still growing when the paper was written, it was not possible to say how long the hormone can maintain active growth in these animals. CHAS. H. RICHARDSON

Time and intensity in photosensory stimulation. SELIG HÄCHT. Creighton Univ., Nebr. *J. Gen. Physiol.* **3**, 367-73(1921).—The photochem. effect of light on *Mya arenaria* depends on its intensity and time of action. When the intensity alone is varied, the photochem. effect is proportional to the log. of the intensity (I); if the time only is varied, the effect is proportional to the time. If both intensity and time are varied, the photochem. effect (E) would be expressed as follows: $E = kt \log I$. Expts. reported show that his equation is true experimentally and strengthen the hypothesis proposed by H. to account for the photosensory responses. (Cf. *C. A.* **13**, 2091; **14**, 780, 1388.) **The relation between the wave-length of light and its effect on the photosensory process.** *Ibid* 375-90.—Results of further experimentation with *Mya* are given. The most effective portion of the spectrum for the stimulation of this animal is near $\lambda = 500\mu\mu$. The results are interpreted as representing the absorption spectrum of the photosensitive substance which is decomposed in the photochem. reaction underlying the sensitivity of *Mya* to light. Cf. *C. A.* **13**, 1605. C. H. R.

Natural and acquired immunity in the caterpillar *Galleria mellonella*. S. METALNIKOW. *Ann. inst. Pasteur* **34**, 888-909(1920).—The work is part of an inquiry into the study of immunity in invertebrates. Most observers have failed to observe antibody production in invertebrates, but some lower forms of life show extraordinary resistance to infection. M. finds the caterpillar *Galleria mellonella* highly resistant to many pathogenic organisms, including tubercle, diphtheria and tetanus bacilli, streptococci, pneumococci and staphylococci, slightly less resistant to plague, dysentery, typhoid and paratyphoid bacilli, the gonococcus and *Sp. cholerae*, and much less resistant to certain saprophytic organisms, including *B. coli*, *B. pyocyaneus*, *B. subtilis*, and *B. proteus*. Endotoxins are responsible for the injurious action in this last group. The caterpillar is not injured by sol. toxins as diphtheria and tetanus. Cobra venom is toxic. The greatest resistance is toward *B. tuberculosis*, and is due to extensive phagocytosis of injected organisms and formation of cellular capsules around them, within which the bacilli are digested. The enzyme could not be isolated. E. R. LONG

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Investigations of meat broths. ERNST WASER. Zurich. *Z. Nahr-Genussm.* **40**, 289-345(1920).—The object was to isolate the aroma-carrying substances in such preps. A series of preliminary expts. showed that the aroma carrier is not extd. by any of the usual org. solvents but may be sepd. by dialysis. In the main expts. W. extd. a dried meat broth prepn. with alc. The alc.-insol. portion was found to contain the aroma of the broth. This portion was fractionally dialyzed through parchment. The largest part of the characteristic aroma was found in the first dialyzed fraction. After complete drying *in vacuo* this fraction was reduced to a finely divided yellowish powder forming a milky soln. in H_2O . Over 88% of the org. components of this fraction were analyzed; the rest probably consists of inosic acid, inosine, carmine, and similar substances. This fraction consisted of 47% inorg. and 53% org. substances. In % of the total org. substances present in this fraction were found taurine or cystine 1.6, NH_3 4.4, creatinine 2.7, creatine 5.4, hypoxanthine 1.4, carnosine, 16.6, methylguanidine 1.3, glutamic acid 7, formic acid 1.4, AcOH 23.9, lactic acid 12.9, org. P as such 2.4. Ten % of the ash was KCl, the remainder being chiefly phosphates. Of the bases there was much K and Ca and a little Na and Mg. W. concludes that the

characteristic aroma is due to the relatively few simple org. substances found mixed in the above fraction with inorg. substances.

L. D. ELLIOTT

Evaporation of fruits and vegetables. W. V. CRUESS. *Am. J. Public Health* 11, 6-12(1921).—Recent progress in the evaporation of fruits and vegetables is reviewed and the results are stated of investigations made at the Univ. of Calif. Expt. Sta. upon grapes, apricots, pears, peaches, prunes, figs and other fruits, with reference to preliminary treatment, temp. of drying, moisture content, humidity, insect control, etc. In general, evapd. fruits are superior to sun-dried in flavor and appearance but are more costly to produce.

NATHAN VAN PATTEN

Composition of the tubers, skins and sprouts of three varieties of potatoes. F. C. COOK. *J. Agr. Research* 20, 623-36(1921).—See C. A. 14, 3696.

Constituents of rhubarb leaves. G. MAUR. *Kiel. Z. Nahr-Genussm.* 40, 345-50(1920). Several cases of sickness were reported to be due to oxalic acid poisoning after eating rhubarb leaves à la spinach. With five other men M. repeatedly ate rhubarb leaves prepared in this way without the slightest ill effects. Analyses of rhubarb leaves were made showing a sol. (COOH)₂ content in the fresh leaves of 0.368% and hydroxymethylanthraquinone, free and combined, 0.05 and 0.01%, resp. To ascertain whether the acid of the gastric juice is sufficient to render (COOH)₂ compds. sol. in harmful amts. a physiol. expt. was carried out in which dried rhubarb leaves were extd. with dil. HCl under conditions as similar as possible to those during digestion in the stomach. The result indicated that no (COOH)₂ is rendered sol. by the acid of the stomach. Since the amts. of sol. (COOH)₂ and hydroxymethylanthraquinone found by M. are known to be harmless, illnesses must be due to other causes. The possibility that a saponin in rhubarb is responsible is suggested. Cf. C. A. 14, 2520.

L. D. ELLIOTT

Vanilla powders. MELVIN DEGROOTE. *Spice Mill* 44, 312, 314(1921).—The compn. of the various vanilla powders and their use, particularly in ice-cream manuf., are noted.

C. W. TRIGG

Strength of terpeness oils and extracts. MELVIN DEGROOTE. *Tea and Coffee Trade J.* 40, 236, 238(1921).—A technical discussion is given of the compn. of the citrus oils and the terpeness oils derived therefrom. Owing to a decreased proportion of subsidiary flavors there is a possible inferiority of terpeness oils to the original oils in regard to aroma and fragrance. The theoretical strengths of terpeness oils and the strength of actual com. oils are noted.

C. W. TRIGG

Comparative experiments on the natural and artificial digestion of crude fiber. W. THOMANN. *Mitt. Lebensm. Hyg.* 11, 227-37(1920).—Studies were made of the crude fiber of wheat straw and cooked straw, the NaOH used in cooking being neutralized in one case and washed out in the other. The crude fiber as detd. by Weender's method contains pentosans and lignin besides pure cellulose. Its compn. is not const. it differs with the type of feed. This method destroys a little cellulose. The Cross and Bevan method gives more fiber and more const. results than the other method. The fiber contains ash, much pentosans, but little lignin. Digestibility of crude fiber by a wether was compared with artificial digestion following the method of Mach and Lederle and the following respective percentages were obtained on corn-germ grits 100-95.72, hay 59.37-54.36, raw straw 47.49-46.23, neutralized cooked straw 70.34-68.80, washed cooked straw 75.31-75.35. Comparisons are discussed showing that for crude fiber the artificial digestibility by the method of M. and L. compares with the natural function of cattle.

H. A. LEPPER

Bracken rhizomes and their food value. JAS. HENDRICK. *Chem. News* 121, 320-2(1920); 122, 5-7(1921).—The rhizomes of the bracken (*Pteris aquilina*), which is a pest in the Scotch pastures, have the following compn.: H₂O, 71.10-70.19%; R₂O ext., 0.23-0.26%; albuminoids, 19.38-17.09%; fiber, 6.17-6.03%; and ash,

1.93-2.55%. Preliminary feeding tests with hogs, cattle and chickens indicate that the rhizomes are too poor in food to be of much use for anything but maintenance purposes. They are not palatable to chickens and even hogs will not eat them unless very hungry.

Hydrocyanic acid in Sudan grass and its effect on cattle. C. O. SWANSON. *J. Am. Soc. Agron.* 13, 33-6(1921).—No harm resulted to cattle when HCN was found in large amts. in Sudan grass used for pasture. Liberation of HCN from Sudan grass is apparently associated with enzyme action. Digestion in water at room temp. and then distn. gave larger amts. of HCN than if H_2SO_4 was added at once. Hot water and dry heat decreased the amt. of HCN obtained. Slow drying caused the HCN to disappear. Making Sudan grass into silage did not diminish the amt. of HCN obtained. Frosted Sudan grass when tested immediately gave very large amts. of HCN but it rapidly disappeared when the plant began to wilt; when dry the HCN had disappeared. While the Sudan grass used in this experiment was not harmful to cattle, although it gave a strong test for HCN, one case is reported where cattle were apparently poisoned by Sudan grass.

F. M. SCHERTZ

Behavior of neutral ammonium citrate in certain phosphate solutions (PATTEN, MAINS) 7. A new reaction of saccharin (THÉVENON) 7. Drying cylinders (Brit. pat. 154,508) 1. Preventing deposition of impurities from chlorine (U. S. pat. 1,867,481) 18.

GRANT, JAMES: *Chemistry of Bread-Making*. 3rd Ed. New York: D. Van Nostrand Co. 236 pp. \$2. (Cf. C. A. 8, 3605.)

Liquid flavoring extract from coconuts. W. ALEXANDER. U. S. 1,366,339, Jan. 25. The greater part of the aq. soln. is sepd. centrifugally from the liquid extd. by pressure from coconut meats. This aq. soln. is adapted for use as a flavoring material. The remaining portion of the ext. may be treated for sepn. of oil from albumin as described in U. S. pat. 1,366,338 (C. A. 15, 1084).

Concentrating fruit juices. E. BARBET ET FILS ET CIE. Brit. 153,548, Jan. 21, 1920. Addition to 135,175 (C. A. 14, 991). Before concg. grape and other fruit juices in multiple-effect app. as described in the principal patent, the juices are treated for the removal of the H_2SO_4 with which they have been treated. A suitable app. is specified.

Treating eggs. H. GREVILLE. Brit. 154,257, June 26, 1919. Liquid, dried, or crate eggs, previous to admixt. with flour, are treated with aerating chemicals, or one constituent thereof, the remaining constituents being added when the eggs are beaten up or with the flour. A suitable mixt. consists of 3 parts acid Na or NH_4 phosphate and 2 parts of $NaHCO_3$ or $(NH_4)_2HCO_3$. Cream of tartar or Ca H phosphate can also be used. NH_4 carbonate, bicarbonate or sesquicarbonate may be used alone, in which case the aerating effect is obtained only on baking, and dried eggs also may be mixed with acid pyrophosphate or other slowly decomposing aerating chemicals, bicarbonate being added later. The addition of $NaHCO_3$ or NH_4HCO_3 has also a preservative action.

Testing milk and cream; butter making. H. M. HÖYERBERG. Brit. 153,446, Oct. 10, 1919. In the process of making butter, the proportion of fat in the milk or diluted cream is estd. with the aid of a soln. acting as a solvent for the casein, and containing a considerable amt. of K Na tartrate, for instance 150-250 g. per l., and a quantity of alkali corresponding to 105-135 g. of NaOH per l. 9.7 vol. of milk are mixed with 3.4 vol. of this soln. and 0.6-62 vol. of isobutyl alc., heated to 60-70°, and the quantity

of fat read off on the butyrometer glass. A modified soln. for use with undild. cream contains 70-135 g. of K Na tartrate and 50-70 g. of NaOH per l.; and the proportions to be taken are 5 vol. of cream, 6.5 vol. of this soln., and 0.6 vol. of isobutyl alc. Cf. C. A. 14, 3289.

Recovering lard from tank water. J. BANNON and F. W. THOROLD. U. S. 1,367,652, Feb. 8. Lard and tank water are drawn from a rendering tank at a point substantially at the line of sepn. of the lard and tank water and hot water is added to maintain the level of the line of sepn. up to the lower portion of the draw-off aperture. The lard and tank water drawn off are held in 2 hydrostatically balanced columns of variant height, lard is drawn from the level of the higher of the columns and tank water from the lower of the columns. The tankage in the rendering tank is washed with hot H₂O and the mixt. is drawn off and similarly sepd.

Milk sugar. R. W. MUMFORD. U. S. 1,366,822, Jan. 25. Clarified and purified whey is evapd. to the point of crystn. after treatment with an open-textured C such as may be prepd. from peat or sawdust, which has approx. the cellular texture of the vegetable material from which the C was made.

Bleaching flour. J. C. BAKER. U. S. 1,367,530, Feb. 8. NCl₃ is used for bleaching and maturing flour. The NCl₃ is required only to the amt. of 1 lb. for 20,000-50,000 lbs. of flour.

Coffee extract. C. W. TRIGG. U. S. 1,367,724, Feb. 8. An infusion of roasted ground coffee is evapd., vapors from the evapn. are condensed, caffeeol is sepd. from the condensate by a caffeeol solvent such as C₆H₁₀, C₆H₁₂, EtCl or MeCl, and the caffeeol is added to the coffee ext. and the solvent eliminated before the completion of the composite ext.

Coffee extract. C. W. TRIGG. U. S. 1,367,725, Feb. 8. A coffee infusion is evapd. *in vacuo* and gaseous products containing coffee aroma are led to a receptacle wherein they are maintained under pressure and treated with a solvent such as C₆H₁₂ ether or EtCl to take up the aroma. The solvent-aroma soln. is then added to coffee ext. under pressure and the pressure is subsequently reduced to permit evapn. of the volatile solvent from the impregnated ext.

Coffee extract. D. S. PRATT and C. W. TRIGG. U. S. 1,367,715, Feb. 8. Aromatic substances from a coffee infusion are absorbed in lactose and the lactose and contained substances are then incorporated with previously prepd. coffee ext.

Coffee extract. D. S. PRATT and C. W. TRIGG. U. S. 1,367,716, Feb. 8. A H₂O-sol. coffee ext. is aromatized by spraying upon it a soln. of aromatic substances of coffee in a volatile solvent and the latter is volatilized by and recovered from a current of neutral gas.

Recovering aroma from coffee. C. W. TRIGG. U. S. 1,367,726, Feb. 8. An aromatized H₂O-sol. coffee ext. is prepd. by passing a non-oxidizing gas such as CO₂ or N through a chamber in which roasted coffee is being comminuted, to carry away the aroma and conducting the aroma-laden gas into contact with H₂O-sol. coffee ext. to impregnate the latter with aroma.

13—GENERAL INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

HARLAN S. MINER

The French chemical industry during the war. A. HALLER. *Bull. soc. encour. ind. nat.* 119, 761-825 (1920).—A review.

The chemical industry and trade of England. O. P. HOPKINS. *J. Ind. Eng. Chem.* 13, 189-97 (1921).

E. J. C.
E. J. C.

The non-metallic mineral industries of the United States. RAYMOND B. LADOO. *Eng. Mining J.* 111, 215-21(1921). E. H.

Industry's supply of energy. GEO. ORIS SMITH. *Mech. Eng.* 43, 165-6, 188 (1921).—"A survey of the available supplies of coal, oil and water, together with a discussion of the engineer's part in the economic and efficient utilization of energy units." E. J. C.

New contacts between the university and industry. WARREN K. LEWIS. *Mass. Inst. Tech. Chem. Age (N. Y.)* 29, 47-9(1921).—A rept. of progress in the reciprocal service of teacher and plant manager in the training of chem. engineers. E. J. C.

Training foremen for the chemical industries. ALLEN ROGERS. *Chem. Age (N. Y.)* 28, 461-3(1920); *Chem. Age (London)* 4, 70-1(1921). E. J. C.

Scientific research, the intelligence department of industry. WM. A. HAMOR. *Successful Banking* 5, No. 12, 8-12, 46, 48, 50, 53(1920). E. J. C.

Utilization of the patentable discoveries of government technical research for the benefit of industry. FREDERICK G. COTTRELL. *Chem. Age (N. Y.)* 28, 447-50 (1920).

Patents as an element of business policy. HAROLD E. POTTS. *Chem. Age (London)* 4, 189(1921). E. J. C.

Rail conveyance of chemical commodities. J. LUKES. *J. Soc. Chem. Ind.* 39, 426-9R(1920); cf. *C. A.* 14, 3764.—L. Archbutt, *Ibid* 40, 9-10R(1921); cf. *C. A.* 15, 281. E. J. C.

Photo-elasticity for engineers. I. E. G. COKER. *Univ. London. Gen. Elec. Rev.* 23, 870-7(1920).—This investigation of stresses by means of polarized light transmitted through models of transparent material under stress is carried out by passing ordinary light through a condensing lens, a polarizer, a mica quarter-wave plate, the transparent specimen which is subjected to the required strain, a second quarter-wave plate, and an analyzer to a screen upon which the specimen is focussed and the colors of the transmitted light examd. By means of this method C. has solved many problems of stress that have hitherto defied soln. by the usual methods of mathematical analysis. The colors obtained by this method indicate a definite stress intensity. If the stresses are simple tension or compression their intensities may be obtained by comparison with those observed on a simple tension member or by means of a color scale like the following:

Color:	black.	gray.	white.	straw.	orange.	brick-red.	purple.
Stress:	0	3.5	5.5	8	10	10.5	11

The principles involved in the method are briefly explained, and it is shown how it is applied in practice. The distribution of stress in any plate subjected to loading can be detd. solely by exptl. means, irrespective of its form and type of load applied, provided the material obeys the law of optical behavior of transparent materials under stress and also that the stresses do not exceed the elastic limit of the material. II. *Ibid* 966-73. The results are given of expts. on the detn. of stress in the neighborhood of a circular hole in the tension member, celluloid models being used. Many of these holes have been examd. optically, and as an example of the measurements there are cited the data obtained with a hole $\frac{1}{4}$ in. in diam. in a plate on which the load applied gave a uniform stress of 570 lbs. per sq. in. of cross-section well removed from the discontinuity. An exploration of the stresses at the different angular points of this boundary showed that the stress varied greatly with the angular distance from the axis, as indicated by the following figures:

Angular distance from axis:	0°.	15°.	30°.	45°.	60°.	75°.	90°.
Stress in lbs. per sq. in.:	-540	-400	-20	+580	+1200	+1530	+1720

These results are substantially the same as those obtained in similar pieces of steel by

other methods. A theoretical proof that stress distributions are independent of the elastic consts. of the material in many cases is outlined. Results covering the case of elliptical holes in tension members and extending the study to cracks and discontinuities are discussed, and the importance of the knowledge of these results in many cases of design, such as boiler plating, steam turbine wheels, and in all cases where a stressed-member contains holes, is pointed out. The paper contains a number of plates showing the colors obtained with tension members with various shaped holes. III. *Ibid* 24, 82-8(1921). The photo-elastic investigation of the testing of materials in tension is discussed. It is shown that if the enlarged ends of a test bar are connected with the parallel part by arcs of a circle, the stress near the joint of the arc with the parallel portion is somewhat greater than that in the parallel portion. This is marked if the radius of the arc is small and approaches a right angle. Taking the special case of the British standard test bar for plates, it was found that in the most unfavorable case this max. value was about 20% above the stress in the bar between the enlarged ends. A cylindrical bar showed the same effect and this max. value of stress is suggested as the reason why in many cases test pieces fail at the enlargement of the parallel portion.

H. JERMAIN CREIGHTON

Electrical drive for centrifuges. JAN POKORNY. *Listy Cukrovar.* 38, 343-4 (1920).

JOHN M. KRNO

ENSOLL, ROBERT: *Technical Chemists' Pocket-Book*. London: E. & F. N. Spon, Ltd. 204 pp. 8s. 6d. net.

HART, EDWARD: *A Text-Book of Chemical Engineering*. Easton, Pa.: Chem. Publishing Co. 211 pp. \$4.

Recovering volatile solvents. F. BINDSCHEDLER. U. S. 1,367,009, Feb. 1. Solvent vapors such as are used in artificial-silk or smokeless-powder manuf. are recovered from air or other gases by absorption in phenols to collect the greater portion of the solvent and treatment of the gases from the phenol-absorption app. with concd. H_2SO_4 to absorb residual solvent vapor and phenolic vapor which has been taken up by the gases: Absorbed solvent is then recovered from the absorbent liquids.

Recovering volatile solvents. H. BOLLMANN. Brit. 153,044, Oct. 21, 1919. Solids to be freed from volatile solvents are moved by means such as a screw conveyor in counter-current to a flow of steam along an inclined passage, alternate sections of which are heated and cooled. A suitable construction is specified.

Treating liquids with gases. P. W. WEBSTER and V. K. BOYNTON. Brit. 154,182, Oct. 27, 1920. In treating a liquid with a gas, for evap., concg. or dehydrating the liquid, or for producing chem. reactions, the gas is forced through porous plates which may be a sintered siliceous material termed "filtros" and which form the base of the liquid-containing vessel. The gas enters the liquid in a very finely divided form. The gas may be heated above the b. p. of the liquid, and passes through without raising the liquid to its b. p. In purifying and concg. sludge acid obtained in treating mineral oils with H_2SO_4 , air or other gas is heated to about 1000° F. and compressed into the chamber to a pressure of 2 lbs. per sq. in. The air passes through the porous plates and rising through the sludge acid removes H_2O and acts upon the hydrocarbons to form volatile satd. hydrocarbons and residual C which can be removed from the acid. H_2SO_4 of 40° Bé. may be concd. to acid of 64° Bé. by passing through it the products of combustion of fuel oil which have a temp. of 1200-1400° F. The temp. of the acid rises to about 249° F. The porous plates may be formed of elec. insulating material.

Filter for liquids and gases. E. W. HASLUP. U. S. 1,366,655, Jan. 25. A filtering medium adapted for purifying gases is prepd. by depositing a sticky mass containing

C, such as activated C which has not been heated to above 600°, on a foraminous support. Gases rich in CO, tarry substances and suspended matter are passed over and through the material until the mass accumulates sufficient wt. to detach itself from the support. A highly efficient purification is thus effected.

Determining viscosity of lubricating oils or other liquids. R. WIGNER v. DALLWITZ and GEORG DUFFING. Ger. 318,398, Nov. 14, 1918. A measuring device of known type is used to measure the height or distance of flow of the oil from a small nozzle supplied by the liquid under a suitable constant pressure.

Cooling composition for use on cutting tools. G. W. PRESSELL. U. S. 1,367,423, Feb. 1. A cooling compn. capable of forming a permanent dil. soln. with a hydrocarbon oil, suitable for use on metal-cutting tools, is formed of S 13, paraffin oil 30, wool fat 30 and lard oil 26 parts.

Packing for stuffing-boxes. A. J. BAILEY. U. S. 1,367,003, Feb. 1. A stuffing-box packing mixt. is formed of pulverized white metal 28 lbs., powdered talc 1 lb., powdered graphite 1.5 lbs., powdered cork 8 oz., tallow 1.5 lbs., carded asbestos 1 lb., and finely powdered mica 1-2 lbs.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Seattle additional water supply plans to go forward. A. H. DIMOCK. *Eng. News-Record* 86, 287(1921).—The plans include utilizing Swan Lake and enlarging Volunteer Park Reservoir, the development to cost \$6,000,000. F. B.

Future water supply needs of the Metropolitan District. ANON. *Eng. News-Record* 86, 179-81(1921).—A general discussion on New York and New Jersey needs in the next 25 to 50 years. FRANK BACHMANN

Mineral waters in 1919. ARTHUR J. ELLIS. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 115-49 (preprint No. 9, published Jan. 21, 1921).

E. H.

Contributions to water analysis. V. L. W. WINKLER. *Z. angew. Chem.* 33, 1, 311-2(1920); cf. *C. A.* 11, 1220.—Methods are outlined for the approx. and quant. detn. of sulfates. The approx. method involves the time required for the liquid to become turbid after addition of BaCl₂ soln. It is accurate to 10 mg. when 1000 cc. water contain 50 to 100 mg. sulfate. The quant method: Slightly acidify the sample with HCl, add 1 g. NH₄Cl, heat to boiling, add BaCl₂ drop by drop, let the soln. stand 24 hrs., filter, dry and weigh. Corrections are applied if the pptn. is carried out in the presence of hardening salts. When Ca and Mg are (first) removed the pptn. of sulfate is quant. G. C. BAKER

Test for nitrites. L. THÉVENON. *J. pharm. chim.* 22, 336-7(1920).—To 10-100 cc. of H₂O to be tested, add 2-3 cc. of a freshly prepd. soln. of 0.5 g. of *p*-C₆H₄OHNH₂·HCl in 100 cc. H₂O and 6-8 drops of 33% AcOH. A deep garnet-red color is formed if nitrites are present, none with nitrates. Unlike Griess's method, only 1 org. chromogenic compd. is required. S. WALDBOTT

Purification of drinking water by lime. JAN SMIT. *Ned. Ind. Meded.* v. d. *Burgerl. Geneesk. Dienst te Willebrorden* 1920, No. 3; *Chem. Weekblad* 17, 545-6.—A brief discussion of the use of lime in water purification relative to sterilization and sand filtration. Pathogenic organisms are not all killed by treatment with lime and alum and filtration should be followed by sterilization with chlorine or ozone. G. C. BAKER

Perfecting purification of water for boilers. G. PARIS. *Chimie & industrie* 4, 722-30(1920).—Continuous method of purification involving treatment of raw water

with NaOH equiv. to its non-carbonate hardness, and heating with boiler escape vapors. Advantages claimed over other methods are: (1) More complete pptn. of Ca and Mg salts, thereby furnishing the boiler with a water of constant salt content. (2) Removal of gases and reduction of amt. of NaOH formed within the boiler, which greatly reduces corrosion. (3) Cheapness. (4) Greater utilization of heat. Diagrams, reactions and data are given.

G. C. BAKER

After-precipitation from treated water—its cause and prevention. C. H. KOVL. Am. Ry. Eng. Assoc., *Bull.* 232(1921).—Thorough agitation and additional treatment with FeSO_4 to reduce the CaCO_3 are recommended.

R. C. B.

Effect of local deposits on the pollution of surface or shallow well water supply. R. L. HOLMES. Am. Ry. Eng. Assoc., *Bull.* 232(1921).—A preliminary report.

R. C. B.

Results of 15 years' operation of the Indianapolis filters. H. E. JORDAN. *Eng. News-Record* 86, 218-9(1921); *Proc. Ind. Sanit. & Water Supply Assn.* 1920.—Filters are of the slow-sand type. Raw water is treated with coagulant and settled before filtration. Air-binding and algae growths lower the efficiency of the filters. The cost of treatment with filter alone was \$5.28 per million gal. while pretreatment, filtration and chlorination cost only \$4.50. With pretreatment a higher rate of filtration is attained. Results indicate that the finished water is of good sanitary quality. The typhoid death rate has been materially reduced since filtration was installed.

FRANK BACHMANN

Water supply and sanitation in the Metropolitan District of New York and New Jersey. GEORGE A. SOPER, GEORGE C. WHIPPLE, ALLEN HAZEN AND J. T. FETHERSTON. *Eng. News-Record* 86, 104-7(1921).—A general discussion.

F. B.

Extent and effect of incrustation in pipe lines. P. M. LABACH. Am. Ry. Eng. Assoc., *Bull.* 232(1921).—General causes of incrustation in pipe lines are corrosion or roughening of the surface, mud or suspended matter, snails or similar growths, iron, etc.; water treatment, and application of heat. Mechanical means is most suitable for cleaning. Incrustation may be minimized by frequent flushing of pipes, aeration before pumping, and prevention of chem. reactions in pipe lines.

R. C. B.

An investigation of perforated-pipe filter underdrains. HARRY N. JENES. *Eng. News-Record* 86, 162-6(1920).—Expts. demonstrated that the head required is a function of the rate of wash, spacing of the laterals, and the spacing of the perforations; and that it decreases with the increased diam. of holes. Laterals 10' or longer should not be less than 3" in diam. The length of laterals to the diam. L/D , both in inches, is the correct ratio for obtaining uniformity of discharge. A ratio of 45 was adopted for the Sacramento plant. Perforations of from $1/4$ to $1/2$ " in size and spaced 3 to 8" has given satisfactory results. The rate of wash from 6 to 36" vertical rise per min. assures uniform distribution without disturbing the gravel.

F. BACHMANN

The sewage treatment plant at Newton, Kansas. IVAN S. SIEGRIST. *Eng. News-Record* 86, 249-50(1921).—The sewage plant consists of a pumping station with Imhoff tanks, a dosing tank, sprinkling filter, final settling basin and flood control manhole. A population of 8,000 is served. The Imhoff tanks are designed for a 1-hr. detention of max. flow. Sludge from the tanks is dried on sand beds. Sludge from secondary tank and effluent from sludge bed are returned to the inlet of the Imhoff tank. The sprinkling filter is of crushed rock 7 ft. deep. The filter was designed on the assumption that 11 g. of N would be produced per day per capita, and that each cu. ft. of filtering material can take care of 0.75 g. N. The filter effluent is settled 1 hr. before discharging into Sand Creek.

FRANK BACHMANN

Sewage works for Lincoln, Nebraska, and suburban towns. ALVORD AND BURDICK. *Eng. News-Record* 86, 221-2(1921).—Lincoln and 4 suburban towns have a population of 70,000 and more than 100 miles of sewers on the separate system. When the extensions are complete about 100% of the population will be served. The daily sewage discharged is 4,500,000 gal., 80% of which is from Lincoln. Treatment will consist of sedimentation and digestion of sludge in Alvord tanks and trickling filter treatment of the settled sewage. The final effluent will be discharged into Salt Creek, which is considered of sufficient size to dispose of the filter effluent without secondary settling. The cost of the treatment plant is estd. at \$330,000 with an annual operating cost of \$12,500.

FRANK BACHMANN

A further study in the economics of garbage reduction. F. S. BESSON. *Eng. News-Record* 86, 258-9(1921).—Operations at Columbus and Washington are compared. The former city percolates its press cake with gasoline while the latter uses no solvent. Grease extn. for Columbus is 1.942% and for Washington 1.76%; tankage 8.6 and 5.8%; and the per ton value of green garbage \$4.05 and \$4.10, resp. A study is being made at the Washington plant of the possibility of increasing the tankage. It is estd. that a mill for grinding tailings and settling basins for recovering sediment in tank water would increase the tankage to about 11% of the amt. of green garbage, of which increase about $\frac{2}{3}$ would be due to grinding and $\frac{1}{3}$ to recovery of the sediment. The value of the sediment is several times that of the ground tankage and the av. value would be increased from \$12 to \$14 per ton.

FRANK BACHMANN

How chemists can cooperate in health work. JOHN D. ROBERTSON. *Chem. Bull.* 8, 1-3(1921).

E. J. C.

The public health work of Professor (William Thompson) Sedgwick. GEO. C. WHIFFLE. *Science* 53, 171-8(1921).—A memorial address.

E. J. C.

Preventing deposition of impurities from chlorine (U. S. pat. 1,367,431) 18.

Treating sewage sludge. L. LINDEN. Brit. 153,335, Aug. 11, 1919. To concentrate sewage sludge, it is agitated by means of air or other gas under pressure or by mechanical means, the sludge being thus subjected to the action of reagent retained by it from previous treatment of the sewage or to the action of freshly added reagent; the agitation is stopped suddenly, the heavy matter settles, and the upper liquid can be drawn off. A suitable construction is specified.

Vaporizing disinfectants, etc. T. F. NEWMAN. Brit. 154,396, Oct. 4, 1919. A vaporizer for diffusing the vapor of volatile oils and disinfectants into the atm. of rooms comprises a liquid container enclosed within a perforated outer receptacle, the intervening space being packed with coke, sandalwood chips, sawdust or other absorbent material which is kept satd. with the liquid by means of a wick passing through a tube. According to the provisional specification, the absorbent material may consist of wood chips pickled in creosote, or of absorbent fiber.

Gas from garbage. J. U. McDONALD. U. S. 1,367,321, Feb. 1. Wet garbage is introduced into the top of a vertical retort an intermediate zone of which is sufficiently heated to render the fixed C of the garbage incandescent at that point. Garbage above the zone of incandescence is thus heated sufficiently to vaporize moisture and gasify volatile matter. The resulting gases, tar vapor and steam are forced down by their own pressure through the incandescent layer, causing all the incandescent C to oxidize to form fixed gases which pass down with the gases of the volatile matter through the ashes in the bottom of the retort.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Report of Committee on the Revision of Methods of Soil Analysis. C. B. LIPMAN, E. C. SHORRY, W. H. MCINTIRE, A. W. BLAIR AND R. STEWART. *J. Assoc. Off. Agr. Chem.* 4, 289-97(1920).—Methods are described for the prepn. of soil samples for analysis and for the detn. of moisture, volatile matter, total org. C, carbonate C, total N, SiO_2 , Fe_2O_3 , Al_2O_3 , P_2O_5 , Mn, Ca, Mg, S, Na, K, nitrate N and alkali salts. These methods were adopted as tentative methods of the A. O. A. C. for the analysis of soils.

W. H. ROSS

Effect of various crops upon the water extract of a typical silty clay loam soil. G. R. STEWARD AND J. C. MARTIN. *J. Agr. Research* 20, 663-7(1921); cf. *C. A.* 12, 732.—Portions of Calif. silty clay loam soil were sifted into eight large containers. Turnips, horse beans, corn and potatoes were planted in sep. containers, 3 containers were planted with barley and 1 container was left for a control. H_2O exts. were made at intervals of 1 or 2 weeks from May to Sept. All crops matured normally excepting corn (due to cold). Cond. tests of H_2O exts. showed a reduction of H_2O -extractable solutes during the middle of the growing season. Nitrate detns. showed that the crops at maturity decreased the NO_3 of the soils to a minimum. F. p. depression expts. were made on 2 sep. samples of soil, the observations being made close to and at a distance from the plants. The concns. are not significantly reduced until the portion of the soil sampled is filled with plant roots.

F. C. COOK

Formation of nitrate in the soil. CHR. BARTHEL. *Svensk Kem. Tid.* 32, 173-83 (1920).—Most of this paper is devoted to a comprehensive discussion of the nitrification problem. Nitrate is formed in acid soil as well as in the neutral and alk. soils as previously established. This applies to clay as well as to loam. The fact established by others that the nitrification proceeds better with org. N compds. than with $(\text{NH}_4)_2\text{SO}_4$ is confirmed; the increase of acid due to the decompn. of the NH_4 salts inhibits the reaction. The addition of CaO is of no advantage in the case of animal manures but is distinctly beneficial in connection with the $(\text{NH}_4)_2\text{SO}_4$. Whether or not the micro-organisms responsible for nitrification are the same in acid soils as in neutral or alk. soils has not been established. Details of the exptl. work, both for the central station and the testing fields throughout Sweden, are published in separate bulletins from the "Centralanstalt."

A. R. ROSS

Technique of determination of soil phosphorus. H. A. NOYES. Ind. Agr. Expt. Sta. *J. Assoc. Off. Agr. Chem.* 4, 93-4(1920).—Satisfactory results for the detn. of P in soils can be obtained as follows: Place 10 g. of the prepared air-dry sample in a 250-cc. graduated Kjeldahl flask, add 0.7 g. of HgO and digest by the regular Kjeldahl method as for total N. Add a crystal of pure NaNO_3 to complete the oxidation. When it is partially cooled, add about 200 cc. of water, and when cooled to room temp. make to vol. Filter through a good grade of folded filter, pipet out 25 cc. of the filtrate into a 250-cc. beaker, and add 15 g. of dry NH_4NO_3 . Heat the soln. to boiling, add about 30 cc. of ammonium molybdate soln., and complete the detn. in the usual way.

W. H. ROSS

The solubility of soil phosphorus. C. H. SPURWAY. Michigan Agr. Expt. Sta., *Quarterly Bull.* 3, No. 1, 28-30(1920).—Four sandy loam soils were treated with quantities of fertilizer equiv. to 1 ton per acre $6\frac{2}{3}$ inches of soil, allowed to stand 2 days in a moist condition and then leached with H_2O equiv. to 3 times the wt. of soil. The exts. were analyzed for P. After a second period of 15 days and a 2nd leaching P was again detd. in these exts. and considered as representing the residuary effects of the fertilizer treatment. Soils 1 and 2 were alk. and 3 and 4 acid to litmus. Quantities of P_2O_5 in soil exts. in lbs. per acre $6\frac{2}{3}$ inches (2,000,000 lbs. soil).

Soil.	Untreated	KCl.	NaCl	NaNO ₃	CaSO ₄	phosphate	Ca(H ₂ PO ₄) ₂	14% acid	Ca(BO ₂) ₂ (rock)	Ca(OH) ₂	CaCO ₃
First Ext.											
1.....	1.54	3.70	2.80	13.74	1.86	12.66	145.08	107.42	8.00	3.50	
2.....	1.86	3.24	5.44	9.72	3.02	15.44	112.04	82.42	21.60	3.70	
3.....	1.54	4.10	18.06	26.08	2.32	14.86	211.14	81.50	7.48	3.08	
4.....	0.62	1.86	7.88	13.44	2.20	15.18	223.80	111.42	7.73	4.16	
Second Ext.											
1.....	2.64	3.24	5.26	17.00	1.94	7.38	20.40	21.92	16.40	3.42	
2.....	2.32	3.40	6.26	23.00	2.08	7.94	18.00	20.38	14.60	4.02	
3.....	2.00	7.56	11.28	10.80	4.36	16.22	31.40	21.00	13.20	3.08	
4.....	1.78	8.66	12.42	9.56	3.04	8.32	26.80	28.40	7.80	4.64	

Nonphosphate treatment greatly increased the soly. of soil P, especially treatment with NaNO₃ and Ca(OH)₂. Rock phosphate gave much more sol. P than an equal quantity of acid phosphate, from which only 20-30 lbs. were obtained by excessive leaching. The conclusion seems justified that the fertilizers used in the expt. cause soil solns. to become more concd. with respect to P and that they remain so for a long period of time.

ALBERT R. MERZ

Research on the effect of ammonium humate. O. LEMMERMANN AND H. WIRSSMANN. *Fühling's Landw.-Zig.* 69, 282-9(1920).—N in the form of ammonium humate was as effective as N in the form of (NH₄)₂SO₄, when used as a top dressing. If the materials were worked into the soil the (NH₄)₂SO₄ was better. Different soils showed very different yielding power due to their different phys. properties and nutrient content.

F. M. SCHERTZ

Concentration of potassium in orthoclase solutions not a measure of its availability to wheat seedlings. J. F. BREAZEALE AND L. J. BRIGGS. *J. Agr. Research* 20, 615-21(1921).—Orthoclase from Riverside, Cal., containing 12.5% K₂O was ground to pass a 60-mesh sieve. Different samples, when brought into equil. with H₂O and analyzed (J. Lawrence Smith method) contained from 2 to 9 p. m. of sol. K₂O, the av. being about 4. The K content of wheat seedlings grown in orthoclase solns. was compared with that of those growing in distd. H₂O or other solns. free of K. Only a small % of the K was absorbed from orthoclase solns. by wheat seedlings. The addition of lime, gypsum and CO₂ did not, nor did boiling, increase the availability of the K. The K of orthoclase is made available by oxidizing with HCl and HNO₃, which breaks down the complex solute mol. The concn. of a specific plant food element in the soil soln. does not necessarily furnish a measure of its availability; this must be detd. by the plant itself.

F. C. COOK

Report on potash. T. D. JARRELL. *J. Assoc. Off. Agr. Chem.* 4, 76-82(1920).—Results are given of a comparative collaborative study of the official and perchlorate methods for the detn. of K₂O in fertilizer materials. The results reported by the different collaborators indicate that the perchlorate method is not as satisfactory as the official method, although excellent results were reported by some analysts using the former method. From the data submitted by the collaborators it is also concluded that the addition of 2 cc. concd. HCl to the water extract of mixed fertilizers is unnecessary in K₂O analysis, and the elimination of the acid is, therefore, recommended.

W. H. ROSS

The outlook for the fertilizer industry. FRANK K. CAMERON. *Chem. Met. Eng.* 24, 9-16(1921).—A review of the present status of the fertilizer industry together with a discussion of possible future developments in the Western phosphate fields, in the manuf. of concd. fertilizers, and in the use of S as a fertilizer.

W. H. ROSS

Report of committee on methods of sampling fertilizers to cooperate with a similar committee of the American Chemical Society. C. H. JONES AND B. F. ROBERTSON. *J. Assoc. Off. Agr. Chem.* 4, 287-9(1920).—It is recommended that a sampler to be satisfactory should remove a core from the bag from top to bottom; that at least a lb. should constitute each official sample; and that the entire sample submitted to the chemist be passed through a 10-mesh sieve previous to its subdivision for analysis. The work is being continued.

W. H. ROSS

The significance of magnesium as a fertilizer. A. JACOB. *Z. angew. Chem.* 33, I, 292(1920).—The German potash syndicate in order to find out the influence of Mg on crop yield conducted expts. during 1917-19 on potatoes. Potash salts sold by the syndicate contained sulfates of K and Mg. Research has shown that Mg probably plays an important role in plant growth. Hence the syndicate is attempting to det. what influence the Mg in their fertilizers has on the growth of plants, Mg has not been considered as desirable in a fertilizer. Results show that the Mg present is probably favorable.

F. M. SCHERTZ

Double moisture determinations in fertilizer materials. J. O. CLARKE. *J. Assoc. Off. Agr. Chem.* 4, 57-9(1920).—Detns. of moisture in different fertilizer materials before and after grinding show that a considerable change may take place in the moisture content during grinding. It is, therefore, concluded that double moisture detns. should be made in the analysis of fertilizer materials, particularly when the moisture is above 10%, and the percentage of active constituent is fairly large.

W. H. ROSS

Nitrogenous compounds in soils. J. K. PLUMMER. *J. Assoc. Off. Agr. Chem.* 4, 106-7(1920).—A comparison of the results reported by different analysts in the analysis of the same materials by (1) the official Kjeldahl method for N detn. in soils; (2) the official method for N in fertilizers; and (3) the Hibbard method for N detn. in fertilizers all indicate that there is little choice between the methods now in vogue for measuring small amts. of N in soils, although the Hibbard method seems to be preferable on account of ease of manipulation of digestion and distn. Nitrates should be detd. on another sample by either the colorimetric or reduction method.

W. H. ROSS

Determination of ammoniacal nitrogen in complex fertilizers with a base of calcium cyanamide and ammonium salts. J. FROIDEVAUX AND H. VANDENBERGHE. Municipal Lab., Paris. *Chimie & industrie* 4, 612-6(1920).—The advantage of using Na_2CO_3 instead of MgO for detg. NH_3 is shown. Add to about 1 g. of fertilizer in soln. 40 cc. of 40% Na_2CO_3 , pass a rapid air current through the ice-cold soln. and absorb the NH_3 in 0.1 N H_2SO_4 . Detns. made on known samples at different time intervals, showed that Na_2CO_3 attacked the NH_3 salt much more rapidly than the CaCN_2 . By plotting the % loss of total N against time for known mixts. of CaCN_2 and $(\text{NH}_4)_2\text{SO}_4$, a curve was formed showing the loss of ammoniacal N (A), and of N in CaCN_2 (B). The rates of liberation of A and of B are practically constant but so different that the intersection of the two curves determines accurately enough the % of ammoniacal N.

C. C. DAVIS

Behavior of neutral ammonium citrate in certain phosphate solutions (PATTEN, MAINS) 7.

DAVIS, W. A.: The Effect of Manuring with Superphosphate and Sannai on the Yield of Crops on Indigo Planter's Estates in Bihar. Calcutta: Government Printing Office. As. 6 (9d.). For review see *J. Soc. Dyers and Colourists* 36, 325(1920).

Fertilizer. A. L. KREISS. U. S. 1,366,509, Jan. 25. A fertilizing material is

prepd. by leaching the product obtained by calcining a mixt. of phosphate rock 10-20 with K-bearing silicate 5-10 and Na_2SO_4 , K_2CO_3 , Na_2CO_3 and K_2SO_4 (one or all) 15-10 parts.

Fertilizer. F. S. WASHBURN. U. S. 1,367,846, Feb. 8. A crude phosphoric acid is prepd. by treating phosphate rock with a small excess of H_2SO_4 (not much over 10% excess), insol. material is removed from the crude acid produced, the latter is mixed with additional H_2SO_4 and the mixt. thus formed is neutralized with NH_3 to produce a fertilizer.

Fertilizers. W. H. HYATT and E. N. FELLOWS. Brit. 153,434, Sept. 26, 1919. A solid fertilizer containing CaCO_3 and Na and Ca sulfates, is obtained by mixing powdered chalk in excess with niter cake. Cf. 2,335, 1901.

Fertilizers. SOC. D'ÉTUDES CHIMIQUES POUR L'INDUSTRIE. Brit. 154,562, Sept. 2, 1920. Addition to 151,597 (C. A. 15, 569). The process described in the principal patent is modified by the use of acid salts for effecting the conversion of cyanamide into urea. The acid salt may contain an element, such as K of fertilizer value. E. g., NaHSO_4 or KHSO_4 , may be used, the soln. concd. *in vacuo*, and Ca or other insol. phosphate added, whereupon a compact mass is obtained. Instead of an insol. phosphate, there can be added any other salt, e. g., kainite, which has fertilizer value or which by taking up H_2O reduces the necessity for evapn. The mixt. of CaCO_3 and C, which remains from the decompn. of CaNCN in aq. suspension by CO_2 , may be used in the manuf. of port. cement.

Fertilizers; insecticides. W. B. BAKER and M. C. SHEPHERD. Brit. 154,057, Oct. 31, 1919. A fertilizer and insecticide is obtained by mixing thoroughly 56 parts of finely ground North Somersetshire granite dust with 21 parts of charcoal or soot, and 35 parts of freshly slacked CaO containing a minimum amt. of moisture.

Fungicide. CHEM. FABRIK LUDWIG MEYER. Ger. 319,126, June 9, 1918. A fungicide is composed of a mixt. of animal tar with tar of vegetable origin or a mixt. of their fractions. E. g., animal tar and tar oil from beech wood tar are mixed in the proportion of 2:1.

Increasing adhesive property of copper-lime spraying liquors. H. CAILLER and C. ARRAGON. Ger. 318,710, Aug. 29, 1918. A mixt. of casein, KOH or alk.-earth hydroxide and CaCO_3 is added to the Cu-lime liquor. E. g., 87 parts CaCO_3 , 5 $\text{Ca}(\text{OH})_2$ and 8 casein are finely powdered, sifted and mixed together. Before use the powder is stirred up with H_2O to a thick slurry which is allowed to stand for some time. This slurry is added to the Cu-lime liquor.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Julius v. Jobst. ALBERT WELLER. Chem.-Ztg. 44, 941(1920).

E. H.

French chemistry and war problems. CHARLES MOUREU. J. pharm. chim. 22, 298-307(1920); cf. C. A. 15, 195.—A review of the pharmaceutical army service, including hygiene and microbiology.

S. WALDBOTT

Keeping qualities of galenical preparations of gentian obtained with an air-dried, unfermented gentian root. MARC BRIDEL. J. pharm. chim. 22, 411-8(1920).—Six preps., a powder (A); an alc. ext. by lixiviation with 60% EtOH (B); a tincture by lixiviation with 60% EtOH (C); a tinct. by maceration with 60% EtOH (D); a tinct. prepd. with boiling 60% EtOH (E); and a tinct. by maceration with 95% EtOH (F) were examd. in 1911 (C. A. 5, 3877; 6, 1814) for sugars and for gentiopicrin; then they were kept without special precautions and again examd. in 1920. The amts. of sugar in A and B have remained the same; in the tinctures C, D, E and F they are diminished;

in *F*; 1.93 g. sucrose has crystd. from 500 cc. of tinct. Of gentiopicrin, only 5.38% disappeared in *F*, 10.06% in *C*, 15.31% in *E*, and 24.73% in *B*. It disappeared entirely (from 5% in 1911) in *A*; in its place is another glucoside hydrolyzable by emulsin, probably an alteration product of gentiopicrin. *D* was free from gentiopicrin in 1911; it now contains a glucoside whose index of reduction approaches that of β -Et-glucoside.

S. WALDBOTT

Strength of terpeneless oils and extracts (DEGROOTE)*12.

BARROWCLIFF, M. AND CARR, FRANCIS H.: Organic Medicinal Chemicals. London: Bailliere, Tindall & Cox. 15s. net.

The Chemist and Druggist Diary for 1921. London: The Chemist and Druggist. 492 pp. For review see *Pharm. J.* 106, 3(1921); cf. *C. A.* 14, 1184.

FULLER, HENRY C.: Analysis of Drugs and Medicines. New York: John Wiley & Sons, Inc. 1072 pp. \$10 net.

FULLER, H. C.: The Qualitative Analysis of Medicinal Preparations. 2nd Ed. rewritten. New York: John Wiley & Sons, Inc. 191 pp. \$2.25.

Flavorings; perfumes. H. TWEEDALE and H. S. TWEEDALE. *Brit.* 154,517, June 30, 1920. In prepg. perfumery and flavoring exts. from essential oils, floral attars, etc., the substance to be treated is left in contact with yeast or the active principles of yeast at a temp. of 65–85° F. A flocculent mass results which is filtered or clarified with albumin, isinglass, K_2CO_3 , potash alum, etc. The clarified liquid may be mixed with H_2O or alc., and salicylic acid or other preservative may be added.

Casein compounds. H. R. NAPP. *Brit.* 154,112, Feb. 28, 1920. Metallic pyrophosphate casein compds., which are of use in therapeutics, are prepd. by dissolving casein in alkali pyrophosphate soln. and adding a metallic salt, such as $CaCl_2$ or $FeCl_3$.

"Synthetic apple oil." F. B. POWER and V. K. CHESNUT. U. S. 1,366,541, Jan. 25. A "synthetic apple oil" is formed of amyl esters of formic, acetic, caproic and caprylic acids, together with AcH ; preferably isoamyl formate 10, isoamyl acetate 10, isoamyl normal caproate 5, isoamyl normal caprylate 1 and acetaldehyde 2 parts. The pat. is dedicated for free use.

Suppository. H. W. RHODEHAMEL. U. S. 1,366,941, Feb. 1. Suppositories are formed of fatty material such as is usually employed with a coating composed of gelatin mixed with glycerol, glucose or gum arabic to increase its toughness and soly.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

It is with deep regret that we announce the death, on April 2nd, of Dr. T. Lynton Briggs. Dr. Briggs has been the Assistant Editor of *Chemical Abstracts* in charge of this section since the beginning of the journal in 1907. He was one of the few remaining members of the original staff of the journal. His faithful, unselfish and excellent service has been of very great value and the loss will be felt keenly. The mere telling of Dr. Briggs' willingness to continue so long in this work, which is without material reward, is a tribute in itself.

Helium, its production and uses. MARC BRIDEL. *J. pharm. chim.* 22, 428–33 (1920).—A review.
S. WALDBOTT

Chromite in 1919. J. S. DILLER. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part I, 87-91 (preprint No. 8, published Feb. 4, 1921). E. H.

The fluorspar industry in 1919-1920. HUBERT W. DAVIS. Bur. Mines, *Repts. of Investigations* No. 2216, 7 pp. (1921). E. H.

Foreign graphite in 1919. ARTHUR H. REDFIELD. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 181-210 (preprint No. 12, published Feb. 5, 1921). E. H.

Potash in 1919. W. B. HICKS AND M. R. NOURSE. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 77-94 (preprint No. 6, published Dec. 8, 1920). E. H.

Strontium in 1919. GEORGE W. STOSE. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 95-8 (preprint No. 7, published Dec. 9, 1920). E. H.

The talc industry in 1920. RAYMOND B. LADDO. Bur. Mines, *Repts. of Investigations* No. 2204, 5 pp. (1921). E. H.

Asbestos. OLIVER BOWLES. *Eng. Mining J.* 111, 155 (1921). **Barytes.** J. B. PIERCE, JR. *Ibid.* 155. **Borax.** GEO. J. YOUNG. *Ibid.* 156. **Fluorspar.** RAYMOND B. LADDO. *Ibid.* 156. **Fuller's earth in Georgia.** S. W. MCCALLIE. *Ibid.* 156-7. **Graphite industry.** BEN. L. MILLER. *Ibid.* 157. **Gypsum.** FRANK A. WILDER. *Ibid.* 157. **Magnesite.** R. W. STONE. *Ibid.* 158. **The mica industry.** J. VOLNEY LEWIS. *Ibid.* 158. **Monazite.** H. C. MEYER. *Ibid.* 158. **Nitrates.** ANON. *Ibid.* 159. **Phosphate rock.** R. W. STONE. *Ibid.* 159. **Potash.** F. W. BROWN. *Ibid.* 159. **Strontium.** J. B. PIERCE, JR. *Ibid.* 160. **Sulfur and pyrites.** ARTHUR E. WELLS. *Ibid.* 160-1. **Talc and soapstone.** RAYMOND B. LADDO. *Ibid.* 161.—Reviews from the point of view of mining and industry. E. J. C.

Measurement of vapor pressures of certain potassium compounds (JACKSON, MORGAN) 2. Electrostatic deposition of dust from blast-furnace gas and the extraction of potash therefrom (BURY, *et al.*) 21.

Nitric acid. A. HENWOOD. *Brit.* 153,362, July 29, 1919. In the production of HNO_3 by the catalytic combustion of NH_3 in O_2 , an excess of the latter is used in such quantity as to cool the catalyst to the lower limit of temp. compatible with an optimum yield of acid, and additional heat is supplied automatically as required to maintain the temp. constant; the additional heat is preferably derived from an elec.-heating coil surrounding the catalyst and supplied with current under the control of a thermostat. Regulation of the temp. can be assisted by varying the speed of the gases, or their pressure. A small mass of Pt sponge is the preferred catalyst; the Pt sponge is supported on perforated alundum, etc., plates resting on constructions in tubes of quartz, glass, or duriron. The tubes lead from a mixing chamber and in each tube in advance of the catalyst is a plug of asbestos maintained in a loose condition by a wire coil and provided to prevent back-firing of the gases. About each tube and adjacent to the catalyst is a heating coil in series with a sep. thermostatic element enclosed by the coil and serving to control the supply of current to it. The gases pass into a collecting-chamber and to a cooling-worm for condensing HNO_3 ; or they may be treated in any usual manner. Cf. *C. A.* 14, 2842.

Condenser or absorber for fluosilicic acid. K. F. STAHL. U. S. 1,367,993, Feb. 8. A filled tower or chamber for absorbing fluosilicic acid is formed of wood treated with an acid-resisting cement such as gilsonite and asphalt paint. The tower has a perforated wooden bottom above the gas inlet.

Sectional apparatus for generating ammonia gas for dry-cleaning machines. C. F. SCHEFFER. U. S. 1,367,718, Feb. 8.

Ammonium sulfate. N. WILTON. Brit. 154,328, Aug. 27, 1919. To remove mother liquor from wet $(\text{NH}_4)_2\text{SO}_4$, the crystals are placed on a perforated plate within a vessel provided with a cover and dry steam or steam and air are blown in from the top by pipe in order to drive the liquid out by a pipe to the saturator or to the tank. NH_3 may be introduced at any stage to neutralize remaining acid. A suitable app. is specified.

Potassium sulfate. FABRIQUES DE PRODUITS CHIMIQUES DE THANN ET DE MULHOUSE. Brit. 154,111, Feb. 27, 1920. Addition to 137,296 (C. A. 14, 1415). The production of K_2SO_4 and HCl from a pulverulent mixt. of KCl and aq. H_2SO_4 is effected in a single direct-flame furnace having a long flame, and which may be divided into three compartments if necessary, the arrangement being such as to provide for desiccation at a low temp., say $120\text{--}300^\circ$, heating at 300° and finally heating at $700\text{--}800^\circ$. Alternatively, a compd. furnace may be employed allowing the same stages of heating, in which one or more of the stages is effected by indirect heat as in a muffle. In another modification the process is effected in a single furnace so as to obtain first a desiccation at $120\text{--}300^\circ$ and in the rest of the furnace a temp. increasing from 300 to 800° , care being taken that the mass moves through the desiccating section slowly enough to remain solid and porous. The H_2SO_4 may be of strength exceeding 70–72% SO_3 .

Potassium and sodium carbonates, hydrogen sulfide. S. LAMM. Brit. 154,498, Mar. 2, 1920. Technically pure K_2CO_3 is obtained by a wet process in which KHCO_3 is decomposed with nascent K_2S . The bicarbonate, preferably in granular form, is intimately mixed with finely ground K_2SO_4 and BaS and the resulting mixt. is added to boiling H_2O . The H_2S produced is eliminated by boiling or by the passage of steam. The bicarbonate goes into soln. with difficulty, but reacts with the nascent K_2S immediately the latter is produced from the BaS . BaS is regenerated from the pptd. BaSO_4 after its removal from the K_2CO_3 soln., from which cryst. or amorphous K_2CO_3 may be prepd. By using NaHCO_3 and Na_2SO_4 in the place of the corresponding K salts, technically pure Na_2CO_3 may be obtained in a similar manner.

Potassium chloride. W. A. SCHMIDT. U. S. 1,367,836, Feb. 8. NaCl is added to mixed salts containing alkali metal chloride and sulfates and the mixt. is sufficiently heated to cause the NaCl to react with the K_2SO_4 with formation of KCl and the latter is volatilized and then recovered.

Sodium permanganate. D. TYRER. U. S. 1,368,076, Feb. 8. NaMnO_4 is produced by converting BaMnO_4 into $\text{Ba}(\text{MnO}_4)_2$ by the action of H_2SO_4 in the presence of free HMnO_4 maintained in the reacting mixt. by slow addition of the H_2SO_4 in order to permit decompn. of part of the $\text{Ba}(\text{MnO}_4)_2$ and then evap. the soln. of NaMnO_4 until it solidifies (after treating the reaction products with Na_2SO_4).

Sodium nitrate. J. B. HOBSDAWN. Brit. 153,649, Aug. 6, 1919. NaNO_3 is obtained from its solns. by first sepg. a considerable proportion of the sulfates and chlorides present by concn. under an abs. pressure of 11 lbs. per sq. in. until a temp. of $90\text{--}95^\circ$ is reached, and afterwards concg. the liquor at atm. or other pressure until the content of chloride (calcd. as the Na salt) is 75–80 g. per l. The concd. liquor is then cooled for the production of NaNO_3 crystals. A suitable app. is specified.

Protalbinates and lysalbinates. C. BENNETT. U. S. 1,367,007, Feb. 1. Alkali salts of protalbinic and lysalbinic acids are used as detergents for cleansing woolen goods or other materials.

Manufacture of aluminium chloride or other halides. C. M. ALEXANDER. U. S. 1,366,626, Jan. 25. Metallic halides are produced by injecting a pulverized metal-bearing material, e. g., Al_2O_3 , fuel such as finely divided C together with gas to support combustion and a halogen, e. g., Cl, into a combustion and reaction chamber (heated to about $900\text{--}1100^\circ$ for the manuf. of NH_4Cl).

Alumina. S. E. SIEBURIN. Brit. 153,500, Jan. 19, 1920. Al_2O_3 is prepd. from a HCl soln. of any aluminous material by calcining the crystals of AlCl_3 obtained by satg. the soln. with the gaseous HCl resulting from a previous calcination. The AlCl_3 is calcined in a continuously working furnace, consisting of several stories, each of which is provided with an outlet, and the gases evolved from a particular batch are not conveyed to the AlCl_3 soln. until they contain sufficient HCl. When an ordinary type of furnace is used, the issuing gases are passed through a condenser, in the first chambers of which a watery soln. of HCl is formed while acid substantially free from H_2O remains uncondensed and is conveyed to the saturator.

Silica-washing apparatus. R. H. MOORE. U. S. 1,366,582, Jan. 25. The app. is adapted for washing a mixt. of silica 65 and clay 30 parts to obtain nearly pure silica.

Catalytic production of sulfur trioxide. H. M. WEBER. U. S. 1,366,430, Jan. 25. A single unitary catalytic mass for the production of SO_3 , in which the gas enters the inner portion and is led off from the outer portion, is so constructed as to the relative cross-sectional area, depth and porosity of the different portions of the mass, that a greater speed of travel of the gases is secured in the outer member, which serves to avoid undue heating of the app. A Sn-Cr catalyst is preferably used.

Nitrogen peroxide. L. DUPARC and C. URPER. U. S. 1,366,773, Jan. 25. An undried mixt. of NH_3 4 and pure O 7 vols. is rapidly passed over a catalyzer comprising asbestos carrying a deposit of Rh at a temp. of $500\text{--}650^\circ$ in order to obtain a practically quant. yield of NO_2 .

Preventing deposition of impurities from chlorine. C. W. SCHIEDLER, JR. U. S. 1,367,431, Feb. 1. CCl_4 1% is mixed with Cl to prevent deposition of impurities from the Cl when the latter is allowed to flow through "Wallace and Tiernan" or similar control valves to app. for purifying H_2O , bleaching flour, etc.

Apparatus for making carbon black. H. A. BUSS. U. S. 1,367,178, Feb. 1. The app. comprizes a rotatable barrel, a burner within and adjacent one portion of the barrel, a hood engaged on one end of the barrel, and a scraper extending into the barrel for engaging its inner surface and removing C therefrom.

Maintaining artificial atmospheres around furnaces for chemical processes. M. C. J. E. DE LOISY. U. S. 1,366,720, Jan. 25. Operations such as the manuf. of Al nitride from bauxite, C and N are conducted in open furnaces in a chamber in which an amt. of N may be maintained.

Phenol-aldehyde condensation products. A. W. WELLER and W. T. ROBINSON-BINDLEY. Brit. 152,384, June 10, 1919. The condensation of phenols with HCHO or its equivs. is effected in the presence of a very small proportion of nitrocellulose or cellulose acetate; the max. amt. of cellulose ester used is about 0.8% reckoned on the phenol. The use of nitrocellulose renders the product odorless, while cellulose acetate also confers increased toughness. In an example, cresylic acid, HCHO , NaOH , and cellulose acetate (0.00025%) are employed; the liquid product is boiled down, baked at amt. pressure, and may be further treated in an autoclave.

Phenol-aldehyde condensation products. A. T. BIRKBY and F. E. BIRKBY. Brit. 153,494, Jan. 13, 1920. Condensation products are obtained by reaction of phenol or its homolog with HCHO in the presence of dil. H_2SO_4 in the proportions of 500 vol. of phenol or its homolog, 450-550 vol. of 40% HCHO , and 2-6% by vol. relatively to the phenol of dil. H_2SO_4 made by mixing 20 vol. of acid of 1.84 sp. gr. with 80 vol. of H_2O , the reaction being effected at a temp. of $60\text{--}80^\circ$. After reaction and removal of H_2O , the product is neutralized, e. g., by milk of lime, and the remaining H_2O is removed by heating, *in vacuo*. The product may be finally hardened by heating under pressure.

Phenol-aldehyde condensation products. F. SCUDDER and R. PATTIGREW. Brit. 153,790, Dec. 16, 1919. A thin aq. liquid condensation product is obtained by reaction of about 1000 parts of carboic acid, 1000 parts of 40% HCHO, and 50 parts of Na_2SO_3 at ordinary temp. for 3-4 days. The product can be applied directly for impregnating fibrous, etc., materials, which are subsequently dried, and hardened by heating under pressure, *e. g.*, in the manuf. of friction blocks or pads or stair treads. Water-sol. dyes may be dissolved in the liquid to dye textile materials.

Plastic compositions formed with yeast. W. MOOSER-SCHIESS. U. S. 1,367,886, Feb. 8. Plastic mixts. suitable for kneading, rolling and molding under high pressure are formed of yeast, glyceryl esters (*e. g.*, acetic, formic, butyric, phthalic or camphanic acid esters), acetyl derivs. of cellulose or sugar or starch, fillers such as cellulose, resins, kieselguhr, mica or soap and hardening agents such as CH_3O or $(\text{CH}_3)_3\text{N}$. Typical mixts. of this kind may be formed of (a) dry yeast 1000, tributyrin 100 and chalk 40 parts; or, (b) wet yeast 1000, triacetin 200 and glycerol 500 parts; or, (c) dry yeast 10-40, triacetin 50 and acetylcellulose 100 parts; or, (d) dry yeast 1000, shellac-glyceryl ester 100 and chalk 40 parts. The yeast may be liquefied by heating before mixing it with the other ingredients. Resin or a soln. of camphor in acetone may be added to modify the properties of the products.

Plastic mass. METROPOLITAN VINCKERS ELECTRICAL CO., LTD. Norw. 31,032, Aug. 23, 1920. A dry, fusible impregnating agent, such as resin or pitch, is mixed with dry cement with or without the addition of asbestos, barytes or other indifferent filler, moistened and given the desired shape. After setting, the hardened mass is heated to the m. p. of the added impregnating agent.

Infusible elastic mass for printing rolls. USHER-WALKER, LTD. and C. E. SOANE. Ger. 321,512, Feb. 3, 1916. A glue mass containing H_2O , such as a mixt. of glycerol with glue swollen in H_2O , is mixed with compds. which result from the condensation of an aldehyde with amines, *e. g.*, of HCHO with aniline or *o*-toluidine.

Infusible elastic mass for printing rolls. USHER-WALKER, LTD. and C. E. SOANE. Ger. 321,513, Feb. 3, 1916. See Brit. 2,167 (*C. A.* 10, 2032).

Printing rolls from elastic masses. USHER-WALKER, LTD. and C. E. SOANE. Ger. 320,696, Dec. 19, 1914. In the manuf. of printing rolls, fusing a mixt. of swollen glue and glycerol to which is added a concd. aq. soln. of hexamethylenetetramine in the proportion of 0.2-1% calcd. from the glue-glycerol mixt., the temp. and proportions are so chosen that the mass acquires the property of infusibility, yet requires considerable time for solidification.

Mica. H. HERRMANN. Brit. 151,962, May 18, 1920. Sheets are made by agglomerating layers of mica flakes and a binding medium such as shellac in powder form by heat and pressure. A suitable app. is specified.

Asbestos fabrics. E. DANHARDT. Brit. 153,558, July 9, 1920. An asbestos fabric particularly for filtering blast-furnace gases consists of a warp or weft of wholly or partly loose-spun asbestos threads, the remainder of the fabric consisting of tightly twisted asbestos threads, or of fine wire, or partly of such threads and partly of such wire which may be enveloped in asbestos threads. The fabric may be roughened on one or both sides.

Coating compositions; bitumen. K. FRIEDRICH. Brit. 154,236, Mar. 27, 1918. A glaze for bricks, cement, etc., consists of cement, coloring matter, and an emulsion of a bituminous substance such as asphaltum, free from volatile oils boiling below 270° , with a soln. of an alkali such as Na_2CO_3 , the emulsion being subjected to an oxidizing treatment, for instance by adding BaO_2 before the addition of the cement.

Treatment of horn. M. LAMBECK. Brit. 154,200, Nov. 22, 1920. Articles of natural horn are exposed to the action of HCHO, its polymers, or substances which

yield HCHO such as hexamethylenetetramine, before or after polishing, for making the coloring matter water-resisting.

Electric resistance. SOC. ANON. KUMMLER ET MATTER. Brit. 153,602, Nov. 10, 1920. A compn. for resistances having a negative temp. coeff. consists of SiC, CaCO₃, graphite and a metallic oxide. The ingredients are ground, mixed and molded to the desired form, and the resulting articles are embedded in sand and heated to a high temp. until a solid body is formed. An example of proportions is 10 parts of SiC, 4 parts of CaCO₃, 4 parts of graphite, and 1 part of Fe₂O₃.

Electric insulators. H. HERRMANN. Brit. 153,885, May 18, 1920. Insulators, etc., are made from a mixt. of powdered mica and a powdered resinous binding agent. The mixt. is heated and pressed in a metal mold and allowed to cool under pressure. In an example, the binding agent consists of 25-30% of copal and the molding operation takes place at a temp. of 350°.

Insulating compositions. H. HERRMANN. Brit. 153,884, May 18, 1920. Resin and fatty oil, such as linseed, poppy, castor or colza oil, are mixed with a refractory earth such as kaolin, an inert insulating material such as mica and an oxidizing agent such as ZnO. The mixt. is maintained at a temp. of 250° for an hr., after which it can be molded to form insulators.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The mechanical properties of porcelain and exact methods for testing. ERNST ROSENTHAL AND FELIX SINGER. *Elektrotechn. Z.* 41, 705-6(1920); cf. *C. A.* 14, 3140. —From the tabulated results the following are taken: Insulator porcelain (a), household china (b), lab. porcelain (c); resistance to compression, (a) 4500, (b) 4500, (c) 4500 kg. sq. cm.; modulus of rupture (a) 590, (b) 640, (c) 410 kg. sq. cm.; tensile strength (a) 98, (b) 112, (c) 117 kg. sq. cm.

C. G. F.

The condition and prospects of the British ceramic industry. J. A. AUDLEY. *J. Soc. Chem. Ind.* 40, 21-2R(1921).

E. H.

Abrasives. J. VOLNEY LEWIS. *Eng. Mining J.* 111, 154(1921).—A review of the industry in 1920.

E. J. C.

The effect of temperature upon the infra-red absorption of certain glasses (GRANT-HAM) 3. Coating compositions (Brit. pat. 154,236) 18. Soldering enamel ware, etc. (Brit. pat. 153,445) 9.

SEARLE, ALFRED B.: **Modern Brickmaking.** 2nd Ed. revized and enlarged. New York: D. Van Nostrand Co. 510 pp. \$7.

Glass-furnace. A. F. PEETERS. U. S. 1,366,745, Jan. 25.

Mining and purifying clay. J. S. HIGHFIELD. U. S. 1,366,456, Jan. 25. A stream of H₂O is forced against a clay face, the resulting liquor is led to a collecting vessel and the liquor in the stream is returned against the clay face until a sufficient concn. is attained. The liquor is then passed to a settling plant, where a small amt. of an electrolyte such as Na₂CO₃ or Na silicate is added and after the liquor has been allowed to settle it is pumped to a treating plant for extg. clay from it by electrolytic treatment.

Treating clay. P. SCHIDROWITZ, W. FELDENHEIMER and W. W. PLOWMAN. Brit. 153,861, June 2, 1919. A process for the treatment of clay comprizes suspending the clay in H_2O with the aid of a deflocculator such as Na_2CO_3 and then, before any settlement takes place, evapg. the whole suspension to dryness. The clay may be first mixed with sufficient H_2O to give a pasty mass and then sufficient deflocculator added to produce fluidity, with or without further addition of deflocculator until the fluidity decreases; or the clay may be directly worked up with H_2O and deflocculator. The clay may be first purified, e. g., by one of the processes described in 106,890 (C. A. 11, 2607) or 121,191 (C. A. 13, 647). The product may be used for incorporation with rubber.

Brick-kiln and method of firing it. H. O. ROBINSON and C. STREADMAN. U. S. 1,367,756, Feb. 8.

Abrasive compositions. F. P. JONES and A. FLEMING. Brit. 153,692, Aug. 18, 1919. A substitute for pumice blocks, etc., for abrasive purposes consists of SiO_2 , sand, firestone, glass, china or the like 76 parts by wt., MgO 7, $MgCl_2$ 7, wax, sawdust, S, or NH_4Cl 10, and H_2O 10 parts. The compn. is molded, and after setting is heated to melt the wax, S, etc., or to char the sawdust. According to the provisional specification, pores may also be produced by the addition of a sol. salt, which is washed out after the compn. has set. The compn. in that case may be SiO_2 , sand, etc., 75 parts by wt., port. cement, 15 parts, $NaCl$ 10-20 parts and sufficient H_2O to bind.

20—CEMENT AND OTHER BUILDING MATERIALS

C. N. WILEY

Notes on the dusting of cement clinker. E. ANDERSON. *Concrete (Mill Section)* 13, 140(1921).—In the course of an investigation on the volatilization of alkalis from cement materials, the so-called dusting of the resulting clinker was frequently observed. The results indicate that although in actual mill practice, extreme cases of dusting probably occur only when the material is unduly high in SiO_2 , this does not necessarily prove that the high SiO_2 content is the chief cause. It seems probable that dusting can occur as a direct result of low kiln temps. or insufficient heating. J. C. WYTT

More observations on the effect of sea water on concrete. ANON. *Eng. News-Record* 86, 121-3(1921).—On the Pacific Coast, from Santa Monica to Huntington, Calif., all the concrete pleasure piers with the exception of one built last summer show signs of disintegration. In general the effect is most marked between the levels of high and low tide, and along the line of reinforcement. A report is also made on the tests being carried on by the Aberthaw Construction Co. at Boston. J. C. WYTT

Modified Vicat apparatus for study of setting time of cement. A. L. MOORE. *Eng. News-Record* 86, 70(1921).—The app. consists essentially of an ordinary Vicat app. in which the movable vertical rod is attached to a beam carrying a counterpoise on the other end. A reading is taking by finding the wt. necessary to cause the needle to penetrate $3/4$ in. into the test piece. A number of curves show the effect of various percentages of H_2O , and the results obtained by different operators. J. C. WYTT

Cement, its inspection and testing. E. J. MASON. *Can. Eng.* 40, 225(1921).—Descriptions are given of the methods in use at the Engineering Materials Laboratory, Hydro-Electric Power Commission of Ontario, reprinted from the Hydro Bulletin.

J. C. WYTT

Tentative specifications for masons' hydrated lime. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 605-8(1920).—The specifications cover chem. properties and tests, physical properties and tests, packing and marking, inspection and rejection, methods of test.

E. H.

The so-called asphalt content of road oils. B. A. ANDERTON AND D. G. TAYLOR. *Proc. Am. Soc. Testing Materials* 20, Part II, 314-23 (1920).—See C. A. 14, 2879.

E. H.

Stone in 1918. G. F. LOUGHLIN AND A. T. COONS. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1918, Part II, 1189-1313 (preprint No. 34, published Oct. 11, 1920).

E. H.

Tentative specifications for gypsum. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 609-11 (1920).—The specifications cover forms and sizes, sampling, chem. properties, physical properties, packing and marking, inspection and rejection.

E. H.

Tentative definitions of terms relating to the gypsum industry. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 658-77 (1920).

E. H.

Tentative specifications for calcined gypsum. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 812-5 (1920).—The specifications cover classes and sizes, sampling, chem. properties, physical properties, calcined gypsum for molding or casting, packing and marking, inspection and rejection.

E. H.

Sand and gravel in 1919. R. W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1919, Part II, 151-64 (preprint No. 10, published Jan. 5, 1921).

E. H.

Tentative test for specific gravity of road oils, road tars, asphalt cements and soft tar pitches. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 764-6 (1920).

E. H.

The conservation of wood. The action of inorganic salts on fungi. FRIEDRICH MOLL. *Centr. Bakt. Parasitenk., Abt. II* 51, 258-79 (1920); cf. C. A. 14, 2066.—The toxic action of salts is an additive property of the ions. The toxic ions in order of their activity are: Hg, Ag, Cd, CN, Cu, Zn, Fe, Co, Cr, F. Most of the acid ions, and the ions of the alkali metals, alk. earths, Mg and Al can be considered inactive. The toxic action depends on whether the salt is sol. in H₂O and ionizes in soln. Just as each ion has a sp. chem. reaction it has a sp. toxic action. The activity of mixts. of ions may be less or greater than or equal to the activity of their components. The activity of a given amt. of a sol. salt or a salt mixt. depends on the amt. of the active constituent in the mixt. and can be computed in the same way as can be the stoichiometric laws of chem. reactions. The application of salt mixts. to the impregnation of wood for protection against decay and fire is herein based on a scientific foundation.

JULIAN H. LEWIS

Purifying molten slag (U. S. pat. 1,366,398) 9. Coating compositions; bitumen (Brit. pat. 154,236) 13.

Howe, H. E.: *The New Stone Age*. New York: The Century Co. 289 pp.

Cement. S. MATSUO. U. S. 1,367,984, Feb. 8. Hot port. cement clinker is added to sand which has been washed with HCl while the sand is still wet and the mixt. is cooled and pulverized to obtain a cement which is resistant to brine.

Hydrocarbon cement. W. S. BARRIE AND L. CHADWICK. Brit. 154,152, Nov. 17, 1920. Pitch, tar, or other substance consisting mainly of aromatic hydrocarbons, and having a sp. gr. of not less than 1.1, is heated to 120-180°, and a powdered inorg. sulfate is stirred in, to produce a cement for general building, road-making, etc., purposes. The sulfates may be hydrated or anhydrous, chemically prepd. or as found in nature, e. g., gypsum, anhydrite, alunite, barytes. The amt. of sulfate added may vary between 1 and 4 vols. to 1 vol. of tar, etc. The powdered sulfate is added gradually with stirring and the stirring is continued until foaming ceases. In a modification,

the tar, etc., and sulfate are placed in a vessel and heated under pressure. The cement is applied at the temp. above stated. The material may also be used as a binder for sand, gravel, broken stone, sawdust or the like. A list of applications is given in the specification.

Cement clinker and by-products. S. B. NEWBERRY. U. S. 1,366,479, Jan. 25. A finely ground mixt. of raw cement materials and carbonaceous fuel is heated by external heat of the gaseous products of combustion of a subsequent stage of calcination of similar material, the condensable products volatilized from the fuel are collected and recovered, and the mixt. is finally calcined by the combustion of the fixed C of the fuel and of gas volatilized from the fuel.

Vertical cement-kiln. J. NELSON. U. S. 1,366,585, Jan. 25. Cement-forming materials, in finely divided condition, are evenly distributed over and fed downwardly through a screen at the top of a vertical shaft kiln and are calcined as they fall by gravity through the highly heated kiln.

Vertical cement kiln. J. NELSON. U. S. 1,366,586, Jan. 25. The kiln has spaced annular walls with a down-draft chamber therein communicating with the space between the walls adjacent to the bottom of the kiln and a baffle plate spirally connected between the walls forming an updraft flue outletting adjacent to the top of the kiln.

Artificial stone. J. WARD. Brit. 153,433, Sept. 25, 1919. Artificial stone is made from a mixt. of cement, Bath stone, and slag with a waterproofing agent consisting of lime, fat and an alk. carbonate or bicarbonate and with or without bitumen, for example, that described in 17,119, 1908.

Coating metal articles with asphalt. J. H. YOUNG. U. S. 1,366,999, Feb. 1. Articles such as sheet metal for building purposes are first coated with a layer of relatively soft asphalt with overlying coatings of harder asphalt and viscose and soapy material which serve to produce a non-tacky surface. Cf. C. A. 14, 816.

21—FUELS, GAS, TAR AND COKE

Heating-furnace fuel progress during 1920. A. E. BLAKE. *Blast Furnace & Steel Plant* 9, 179-80, 181(1921). E. J. C.

Froth-flotation applied to the separation of coal. ANON. *Iron and Coal Trades Rev.* 102, 197(1921), 2 figs.—The Minerals Separation, Ltd., has recently applied their flotation process for the sepn. of metalliferous ores to the sepn. of coal from dirt. Coal crushed to a fineness of not more than $\frac{1}{10}$ -inch is mixed with 4-6 times its wt. of water, the mixt. agitated either by a rotary agitator or by injection of air, and a reagent, either oil or coal tar or some industrial waste product, added. The air bubbles formed float the coal particles to the surface but the ash-forming dirt sinks to the bottom. About 1 lb. of reagent is required per ton of material treated. When the coal contains pure coal, bone coal or shale of fairly high calorific value and shale of low calorific value, the 2 former can be recovered separately, the shale being rejected as waste. A typical sepn. of a coal with 10.14% ash gave pure coal 87.2% with ash content of 3.25; bone coal 2.4% with 19.2 ash; and shale 9.5% with 72.1 ash. The process is applicable to coals carrying up to 60-70% of ash. J. L. WILBY

Quantity of coal in a natural conical pile. W. F. SCHAPHORST. *Elec. Rev.* 78, 234(1921).—A chart is given by which the size of plot required for a certain tonnage, or the tonnage from the dimensions of the conical pile of bituminous coal can be detd.

W. H. BOYNTON

Determination of sulfur in the products from washing illuminating gas. K. J. LEANDER. *Svensk Kem. Tidskrift*, 32, 184-5(1920).—The method used at the plant is that published in Straches' *Handbuch Gasbeleuchtung und Gasindustrie*. This method gives results that are 5% too low owing to the presence of FeS. To overcome this L. oxidizes the sample with concd. HNO₃ and KClO₃, removes the Fe by pptn. with NH₄OH and then ppts. the S as BaSO₄. A. R. ROSE

Robinson's patent mixed-gas plant. ANON. *Gas J.* 153, 335(1921), 1 fig.—A complete gasification plant patented and operated by F. H. Robinson is described. The operation is wholly satisfactory and additional settings are to be installed. The plant consists of a horizontal retort-setting with shortened retorts terminating in a water-gas generator. When the plant is being started, coke is fed into the generator, blown to a high temp., and blue water-gas made; the blow gases are used to heat the horizontal retorts. The blue water-gas passes through the retorts, over the charge, sweeping out the coal gas directly into the hydraulic main. The amt. of coal carbonized is largely controlled by the consumption of coke in the generator, which is in turn controlled by the air-blast and the amt. of steam used. Any quality of gas can be produced, from 280 to 460 B. t. u. depending upon the amt. of steam used for water-gas production, with yields of 65,000 and 40,000 cu. ft. per ton, resp. Low-temp. tar is produced, and good yields of NH₃, or the plant can be arranged for gasifying the tar. The plant can be run for producer gas, blue water-gas, and mixed gas of medium or high quality. J. L. WILEY

Gas firing on the Bonecourt system. GREGSON. *Proc. So. Wales Inst. of Engineers* 36, No. 2; *Gas J.* 153, 282-3(1921).—Abstr. The high thermal efficiency of the Bonecourt boiler in its present form is due to (1) perfect combustion with very little excess air, and (2) rapid heat transference to the water by radiation as well as by conduction. The fire-tube boiler is the best type for waste heat utilization especially when operating on induced draft. Therefore, the Bonecourt type is especially applicable. Such boilers designed for dealing with gas-engine exhaust are giving excellent results. A 500-b. h. p. gas engine running continuously 6 days a week at 80% full load developed in such a boiler with its exhaust 1100 lbs. of steam per hr., steam was available at working pressure in about 30 mins. after the gas engine was started. A Bonecourt waste-heat boiler in connection with regenerative retort ovens showed an efficiency of 50.7% without economizer and developing steam at 100 lb.-gauge pressure. By using the surplus gas from by-product ovens, about 625 lb. of steam per each 1 s. of fuel cost is made available, with the cost of the gas at 9 d. per 1000 cu. ft. J. L. WILEY

Possibilities of gaseous heating. W. N. BOOTH. *Gas J.* 153, 223-7(1921); *Gas World* 74, 77-8(1921).—The utilization of gas in relation to industrial furnace heating is discussed. Theoretical consideration is given to such problems as calorific intensity of various fuels and its relation to the thermal efficiency of a furnace, and loss of heat through furnace walls and its prevention. Thermal efficiencies of furnaces have been very low, av. only about 18 to 20%, but improvement is being made and efficiencies of 50% are predicted. J. L. WILEY

The development of the vertical (gas) furnace. F. DOLLE. *Hel Gas* 40, 207-11 (1920).—Summary. NATHAN VAN PATTEN

Gas industry on the heat-unit basis. V. Gas regulation act from the commercial point of view. F. W. GOODENOUGH. *Gas J.* 153, 277-8(1921); cf. *C. A.* 15, 937. VI. Financial aspects of the gas regulation act with special relation to the work of the accountant. H. E. IBBS. *Ibid* 153, 331-2. J. L. W.

Education and training of the gas engineer. WM. BENNETT. *Gas World* 74, 113-5(1921); *Gas J.* 153, 337-9(1921). J. L. W.

Some aspects of gas distribution. F. R. G. GRANT. *Gas World* 74, 116-7(1921); *Gas J.* 153, 339-40(1921).—G. discusses high-pressure distribution and main-laying. Only welded joints can be efficient in preventing gas leakage. J. L. W.

Coal-tar research at Shadyside. JOHN MORRIS WHISS AND CHARLES RAYMOND DOWNS. *Chem. Met. Eng.* 24, 150-5(1921).—The lab., the organization and the work of the research dept. of the Barrett Co. are described. E. H.

Obtaining lubricating oil from bituminous coal. A. SANDER. Darmstadt. *Schweis. Chem.-Ztg.* 45, 553-6(1920).—An abstract of a summary of work so far accomplished in this field. W. F. PARAGHER

Treatment of benzene acid sludge. G. STEPHENSON. *Gas World* 74, No. 1907 (Coking and By-Products Sec.), 19-20(1921); *Chem. Trade J.* 68, 176(1921).—In working up the acid sludge produced in the purification of benzene, in the usual regenerative-type still, great trouble is experienced from the frothing with the consequent carrying over of the impurities with the benzene vapors. Tests were made with satisfactory results of introducing a jet of NH_3 gas into the head of the still to reduce this frothing. This also had the advantage of eliminating the strong odor of H_2SO_4 in the benzene by neutralizing the acid vapors. After the operation was completed, the still contained a hard pitchy mass of residue requiring the use of a pick to remove it. This difficulty was removed by continuing the steaming for a time after the acid liquor was removed, giving a mass more soft and spongy and easily removed. A new still was designed and erected which eliminated the objections of the former type. It recovers about 20% of the benzene, and gives a product water-white in color, with a brown color test and only requiring distn. If desired, the benzene, whether the NH_3 was used or not, could be washed with 1% of H_2SO_4 followed by a soda wash. The acid liquor after the distn. was finished varied in strength from 35 to 55% calcd. as H_2SO_4 , and of that about 5% was H_2SO_4 when NH_3 was not used. The residue could be utilized as fuel; its compn. being 74% volatile carbonaceous matter, 25% fixed carbonaceous matter and 1% ash. By washing it with water, drying and distg. in an iron retort, liquor and certain oils were obtained; the liquor being satd. with SO_2 and S in suspension. The residue in the retort was coke and contained 1% ash and 6.5% S. It yielded 38% liquor, 15 total oils, 25 coke, 22 SO_2 and non-condensable gas. The acid liquor was treated to recover pyridine oil, of which 8% was obtained. The plant had proved capable of dealing with the sludge in a satisfactory manner, recovering almost pure motor benzene, H_2SO_4 of a reasonable strength and a carbonaceous fuel. J. I. WILEY

Manufacture of sulfate of ammonia. M. E. NICKLIN. *Gas World* 74, No. 1907 (Coking and By-Products Sec.), 15-9(1921); *Gas J.* 153, 280-2(1921); *Iron and Coal Trades Rev.* 102, 160(1921).—N. describes resp. the indirect, the semi-direct, and the direct processes of sulfate manuf. and summarizes their advantages and disadvantages. In plant control the acidity of the bath should be kept fairly const. and for this purpose hourly titration tests using normal NaOH solns. should be taken and the Tw. of the liquor detd. at the same stated intervals. The 2 figures together give a good indication both of the acidity of the bath and the degree of satn. of the mother liquor. One of the most troublesome problems is that of stoppages in the saturator. Faulty distribution of gas or NH_3 vapors, and faulty elimination of the crystd. salt from the saturator are due usually to defects in the design which can be corrected. Irregular and wrong methods of working are also causes of stoppages, and too low temps. of the bath favor them. By periodically raising the acidity of the bath, any salt tending to set in the app. is redissolved by the added acid and prevented from accumulating. By increasing the limits of acidity to a max. of 10-15% of free acid and then working down to 3%, trouble can be avoided. Irregular working is most likely to occur in the

semi-direct process, owing to the fact that both temp. and the amt. of the gas and NH_3 vapors vary so considerably from time to time. In order to obtain a neutral salt especially in direct plants without spraying with NH_3 liquor in the centrifugal or by the use of hot NH_3 gas, water-spraying was tried, and succeeded in producing a salt containing only 0.01% of free acid. Ultimately neutral sulfate can be obtained on direct plants by first spraying the salt with a fine spray of water and then drying it in a machine along with the addition of the required amt. of alkali. J. L. WILEY

Steaming results at Ottawa. F. ELCOCK. *Gas J.* 153, 284-5(1921); cf. *C. A.* 14, 3519.—Steaming has been practiced continuously for 3 yrs. in the Glover-West retorts with very little wear on the retorts. Light steaming accounts for about 1700 cu. ft. of gas per ton of coal in making 535-B. t. u. gas, but with heavier steaming and 465-B. t. u. gas, there is an increase up to 6500 cu. ft. per ton or an increased efficiency of at least 9%. NH_3 increases 1.15 lb., tar 1.25 gal., coke decreases 8% and fuel consumption increases 7%. Comparative efficiencies of gas production in horizontal retorts, vertical retorts with light steaming, and vertical retorts with heavier steaming are, resp. 10,500 cu. ft. per ton or 21.4%, 12,250 cu. ft. or 24.5%, and 17,500 cu. ft. or 30.14%. J. L. WILEY

Quenching coke from the retort with steam. P. T. KUMMEL AND H. L. KROFF. *Het Gas* 40, 239-42(1920).—When coke is quenched with steam in a generator, the steam is raised to a max. temp. of 440° . The water gas produced in the vertical retorts is increased in quantity and the quality is improved by the influence of the superheated steam. The coke is of better grade and much lighter in wt. than ordinary coke, and the overhead cost for equipment is materially reduced. N. VAN PATTEN

Sulfur distribution in carbonization. U. O. HUTTON AND C. C. THOMAS. Johns Hopkins Univ. *Gas Age* 47, 88-94(1921).—The method and the app. are described. Six charges were carbonized with an av. distribution of S as follows: lb. S in coal per ton 38.61; in coke 24.62; in tar 1.17; org. S 0.2; H_2S 10.2; in liquor 0.6; unaccounted for 1.92. It was found that the total S in the gas could be reduced by three methods: low-temp. carbonization, full charges and liming the coal. J. L. WILEY

Position of the ascension pipe. G. E. FOXWELL. *Gas World* 74, No. 1907 (Coking and By-Products Sec.), 12-5(1921).—F. discusses the effect on the working of coke ovens of changing the position of the ascension pipe from the center to the end of the oven. The length of travel of the gases as a whole, in the free space, is doubled as is also their mean velocity, which in itself is one-half the velocity of the gases entering the ascension pipe. The time spent by the gases in the oven is independent of the position of the ascension pipe, and there is no increase in pressure on account of that nor any change in the coking time. Theoretically the pressure difference is raised four times owing to additional friction, yet the total pressures are so small as to be quite negligible. No disadvantage whatever is incurred by the change in the position of the ascension pipe. J. L. WILEY

By-product ovens at Woodward (Ala.). EMIL PIRON. *Gas Age* 47, 83-5(1921).—A description is given of the Piron coke ovens. The advantages claimed are: a shorter coking time, about 10-20%; large coke output; large amt. of surplus gas, a saving of about 25% for heating purposes; easy operation; and strong construction. The most prominent characteristics are the continuous method of heating from the top downward, without inversion of any kind, the arrangement for continuous recuperation of heat instead of employing the usual regenerative system, and the perfect automatic regulation of heat throughout the whole side wall. J. L. WILEY

Test for specific gravity of asphalts and tar pitches (ANON.) 22. Industry's supply of energy (SMITH) 13. Rare gases of the natural gases of Alsace-Lorraine

(MORSE; LEFAVE) 8. The word "gas" (THERNEDEN) 2. Gas from garbage (U. S. pat. 1,367,321) 14. Calcining coke for electrodes (U. S. pat. 1,366,467-8) 4.

RONALDSON, J. H.: Coal. London: John Murray. 186 pp. 6s. For review see *Nature* 106, 595 (1921).

Fuel. J. W. LEADBETTER. Brit. 154,319, Aug. 23, 1919. Black or lower-strata peat, in its natural moist state as it leaves the bog, is finely disintegrated and mixed with ground CaO and with pitch or tar and fine coal. After these ingredients have been well mixed in a mixing machine, the mixt. is ready for use without being pressed or formed into blocks, and can be handled in the same manner as ordinary coal. The CaO may be replaced by hydrated CaO, or by one or more alkalis having properties similar to CaO. The proportions employed may be as follows, namely, peat 168 lbs., pitch 8 lbs., lime 4 lbs., coal 270 lbs.

Liquid fuel. L. W. BATES. Brit. 154,538, Nov. 24, 1920. Water-gas tar or oil-gas tar containing not more than about 10% H₂O is blended with fuels, such as oils, tars, and oils containing coal dust or other carbonaceous particles, to reduce their viscosity and so facilitate atomization. In an example, 20% of water-gas tar is heated and agitated at 175–220° F. for 1–3 hrs. with a topped Mexican oil; the viscosity is reduced from 600° to 300° Engler at 70° F. Cf. C. A. 14, 3313.

Liquid fuels. L. W. BATES. Brit. 153,591, Nov. 9, 1920. To liquid fuels are added very finely pulverized carbonaceous substances heavier than H₂O so that the flash point and sp. gr. are raised sufficiently to render safe the heating of the composite to a temp. at which it can be atomized, and to render it storable under H₂O or, in case of fire, extinguishable by H₂O. The stability of the composite may be increased by raising the viscosity of the liquid, by addition of Ca resinate or a peptizer such as coal tar, creosote, naphthalene, water-gas tar, or "solvent naphtha tar," or by emulsifying with a liquid hydrocarbon immiscible with the first. Cf. C. A. 14, 3313.

Liquid fuel; purifying oils, etc. A. M. O'BRIEN. Brit. 153,365, July 30, 1919. A fuel for heating, lighting, or internal-combustion engines consists of a mineral or vegetable oil or fat, purified as detailed below, and $\frac{1}{220} - \frac{1}{80}$ vol. of a 40% soln. of HCHO, mixed or not with about $\frac{1}{4}$ vol. of a light inflammable hydrocarbon such as benzene or motor spirit. Oils, etc., specified are crude, light, and heavy paraffin and kerosenes, and colza oil. The purification is effected by mixing $\frac{1}{4}$ fl. oz. of concd. H₂SO₄ with each gal. of oil, keeping the temp. down to at least 10°, standing for about 2 days, and neutralizing the supernatant liquid as by soda ash, pearl ash, Na₂CO₃, or finely divided Zn, and washing with H₂O. SO₂, liquid or gaseous, or oxalic acid may be used in place of the H₂SO₄. Fats are treated while melted or dissolved in paraffin. The complete mixt. is filtered through wash leather, animal charcoal, MgCO₃, or SiO₂ before use. The used SiO₂, etc., may be utilized as an ingredient of artificial fuel, or may be treated with a solvent for the oil, etc., and reactivated by heating; in the latter case the extd. oil or fat may be used in the manuf. of soap.

Motor spirit. E. C. R. MARKS. Brit. 153,925, May 7, 1919. A motor spirit with a f. p. below –60° F. consists of: (1) 40 vol. of EtOH, 28 vol. of gasoline, 17 vol. of C₆H₆, 7.5–10.0 vol. of ether, 8 vol. of toluene; or (2) 20 vol. of EtOH, 20 vol. of gasoline, 15 vol. of kerosene, 35 vol. of methyl ethyl ketone, 5 vol. of ether; or (3) 15 vol. of C₆H₆, 40 vol. of alc., 30 vol. of gasoline, 15 vol. of ether.

Motor fuel. W. J. HOFFMAN. U. S. 1,367,968, Feb. 8. A hydrocarbon distillate such as kerosene is mixed with a soln. of picric acid and MeOH impregnated with C₂H₂ in order to produce a motor fuel.

Carbonizing. H. EDWARDS. Brit. 153,663, Aug. 9, 1919. Coal, shale, etc., to be distd. at low temp. are finely ground and concd. by a metallurgical process to

remove pyrites. The distn. is preferably carried out in a retort through which the material is conveyed while being heated gradually to a temp. of about 500°.

Purifying gas. N. E. RAMBUSH. Brit. 153,665, Aug. 11, 1919. S is removed from gases by passing them through a suspension of a suitable oxide, *e. g.*, hydrated Fe_2O_3 , in H_2O or sulfate, and subsequently revivifying the suspension by means of air or O. A suitable app. is specified.

Enriching gas. C. PERDRISAT. Brit. 153,045, June 24, 1919. In a carburetor for enriching gas, of the kind in which the gas is passed through a constant depth of liquid, the level of which is maintained by means of a liquid supply pipe depending from a storage vessel, the upper end of the tube through which the liquid is supplied from the storage vessel to the carburetor is provided with a valve tending to be kept closed by a spring but held open when a stopper is screwed home to close the filling-opening. The gas to be enriched enters through a pipe and, after bubbling through the liquid, passes through an outlet provided with a metal grid.

Recovering ammonia from gases of dry distillation. GEHR. HINSELMANN. Ger. 320,415, Oct. 1, 1912. The gas is cooled in a scrubber and conducted to the acid bath, and the hot condensate, after sepn. of the tar, is treated to ext. the NH_3 . For this purpose, the NH_3 is expelled from the hot condensate in a bath of milk of lime provided with a stirring device, without direct introduction of steam and with the application of but little external heat. A suitable construction is specified.

Ammonium chloride. W. OSTWALD. U. S. 1,367,082, Feb. 1. Fuels such as coal are burned in the presence of chlorides while injecting H_2O or steam into the combustion zone in order to produce NH_4Cl from the fixed N present in the fuel.

Vertical retort for producing gas. J. E. CHRISTOPHER. U. S. 1,367,512, Feb. 1. Gas-producer for use on self-propelled vehicles. J. WELLS. U. S. 1,367,445, Feb. 1.

Incandescent mantles. H. PACE. Brit. 153,828, Mar. 9, 1920. The fabric of an incandescent mantle is formed of chrysotile alone or of chrysotile and ramie, artificial silk, or other material. A yarn composed of chrysotile and ramie may be employed or the warp and the wool may both be of alternate chrysotile and ramie threads. Artificial silk may replace the ramie.

Gas mantles. H. R. STEVENS. Brit. 154,138, June 2, 1920. Mantles for gas lighting are strengthened by coating with a viscous fluid or thin paste formed of kaolin or like clay mixed with H_3PO_4 or with H_3PO_4 and Al silicate, *e. g.*, in the proportion of 9 parts of sirupy H_3PO_4 to 1 part of Al silicate. The compn. may be applied by revolving the mantle on a lathe and using a brush. Inverted mantles are coated around the supporting ring, which may be roughened or indented or provided with holes, and upright mantles at the loop and shoulder, preferably on both sides. Mantles, already partly or wholly manufd. may be coated then dried and baked over a Bunsen flame or in an oven.

Grinding pitch. GEHR. PFEIFFER, BARBAROSSA-WERKE. Ger. 318,656, Dec. 10, 1915. The ground material is cooled and sifted in an air sifter, where the fine portion is sepd. while the coarse portion is returned to the mill. The mill may be of the hammer or disintegrating type. The air sifter may be provided with a water jacket in order to cool the pitch during sifting.

Still for pitch. H. P. HIRD. U. S. 1,368,149, Feb. 8. A still for distg. pitch is constructed of the general configuration of a large pipe "elbow" with removable ends from which vapor pipes lead, placed over a fire-box with its longest arcuate surface downward.

Spray condensers for the recovery of by-products from coke-oven distillates. A. ROBERTS. U. S. 1,366,494, Jan. 25. Gas is passed in succession through a series of

spray condensers and oil pptd. in the condensers is returned to the spray device of a preceding condenser, in order to effect heat interchange and regulated fractional condensation.

22—PETROLEUM, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Petroleum. F. G. CLAPP. *Eng. Mining J.* 111, 152-4(1921).—A review more particularly from the production standpoint.

E. J. C.

Recent articles on petroleum and allied substances. E. H. BURROUGHS. *Bur. of Mines, Repts. of Investigations* No. 2188, 23 pp.; No. 2198, 27 pp.(1920); No. 2210, 24 pp.(1921); No. 2222, 36 pp.(1921).—A bibliography with brief abstracts in most cases.

E. J. C.

Carbonization of lubricating oils in internal-combustion engines. F. H. GARNER. Mellon Institute. *Gas World* 74, 84-5(1921); *Chem. Age (London)* 4, 96; *Engineering* 111, 82-3.—Abstr. of a paper given before the Inst. of Petroleum Technologists, London. The decompn. of an oil in an engine can occur in 2 ways: (1) by rapid carbonization due to exposure of the oil in form of a fine spray to the explosion flame, thus causing incomplete combustion of the oil, the result of such carbonization being the production of C and asphaltic material; (2) gradual carbonization of the thin oil film on the piston and cylinder heads at temps. of 200-400°, giving first asphaltic material, which is changed to C by the prolonged action of these temps. A method for detg. the asphaltic resins in lubricating oils has been devised by utilizing the selective absorptive power of animal charcoal for these resins. It has been shown that in similar oils the resin content influences both the extent of the carbonization at high temps., and the coke value as detd. by Conradson's method. Exptl. work on the evapn. and carbonization of a series of lubricating oils derived from Texas and Penn. crudes shows that (a) oils of similar distn. range have similar evapn. losses at the same temp. of evapn.; (b) there is direct connection between evapn. loss and the fire test of an oil, but the original content of impurities must also be taken into account; (c) carbonization increases much more rapidly than the evapn. loss, both as regards increase of time at a particular temp. and increase of temp. after heating for the same length of time. The original article gives full details of the investigation, and discusses the relation between flash-point, fire-test, and distn. range of an oil and the relative value of its carbonization test and its coke value as an indication of its value for lubricating internal-combustion engines.

J. L. WILEY

Oxidation of paraffin to wax in ultraviolet light. AD. GRÜN AND TH. WIRTH. *Aussig. Z. angew. Chem.* 33, I, 291-2(1920).—A Uviol glass test-tube 36 cm. long and 43 cm. in diam. was fitted with a cork-stopper carrying an inlet tube, reaching nearly to the bottom of the test-tube, a delivery tube, and a thermometer. The inlet tube was connected to a cylinder of compressed air, and the delivery tube to a reflux condenser. The volatile products which passed the condenser were condensed in receiving flasks filled with fragments of glass which were cooled in an ice-bath. The test-tube was set in an air bath of asbestos papers (12 × 12 × 40 cm.), with a slit 4 cm. wide cut in one side for admitting the ultraviolet light. Two of the other sides were provided with windows of mica. A 110-volt Uviol lamp placed directly in front of the slit illuminated the test-tube throughout its whole length. The conditions were apparently as favorable as those used by T. T. Gray (*C. A.* 9, 3358). One hundred g. of paraffin wax (solidifying point 52°) was heated to 160°, and a current of air led in (10 l. per min.). The results were similar when light was used, and when it was not used. In the 3-hr. tests, 86 g. of substances remained in the test-tube, and in the 5½-hr. runs,

78 g. The analyses of the products showed that they were similar in the two cases. The same thing is true of the distillates, with any differences in favor of the runs not using the lamp.

W. F. FARAGHER

Tentative test for specific gravity of asphalts and tar pitches sufficiently solid to be handled in fragments. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 767-9 (1920).

E. H.

Test for specific gravity of road oils, road tars, asphalt cements and soft tar pitches (ANON.) 20. Industry's supply of energy (SMITH) 13. Casinghead gasoline explosion (DUNN) 24. The origin of petroleum (GENTIL) 8. How oil is manufactured in Nature's laboratory (BISHOP) 8. Examination of lubricating oils (ROBERTSHAW) 1. Liquid fuel; purifying oils, etc. (Brit. pat. 153,365) 21. Filter for gasoline (U. S. pat. 1,367,783) 1.

EVANS, ELLIOTT A.: *Lubricating and Allied Oils*. London: Chapman and Hall, Ltd. 9s. 6d. For review see *Chem. Trade J.* 68, 121(1921).

HAMOR, WILLIAM A., AND PADGETT, FRED W.: *The Technical Examination of Crude Petroleum, Petroleum Products and Natural Gas*. New York: McGraw-Hill Book Co. 591 pp. \$6.00.

Petroleum refining. J. G. P. EVANS. U. S. 1,366,642, Jan. 25. One end of a horizontal body of oil is heated and heat is transmitted by contact toward the opposite end of the body so that the body decreases in temp. toward the opposite end. Vapors from the hottest portion of the oil are brought into contact with vapors from less highly heated oil to effect heat-interchange and condensation of heavier portions of the hottest vapors and products of this fractional condensation (which may take place in a plurality of stages) are separately drawn off and collected. The process may be carried out in a horizontal still with partitions extending up from its bottom partially to segregate different portions of the oil in the still (leaving communicating spaces above the partitions) with condensate-collecting and draw-off devices leading from the different compartments of the still. U. S. 1,366,643 relates to a similar process in which the oil is held in a conical still, heated at the top only, from which vapors are led downwardly, in heat-exchanging relation, within a shell surrounding the conical still, where fractional condensation is effected at different levels in sep. draw-off chambers.

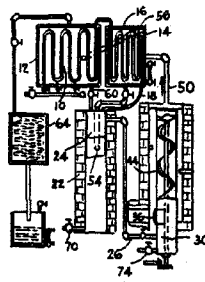
Purifying oils. J. SMITH. Brit. 153,844, Apr. 14, 1920. Petroleum, paraffin, and other mineral oils are freed from S, P, and other impurities by heating in a closed vessel to a pressure of 100-150 lbs. per sq. in. with cotton waste or other absorbent satd. with a 1-5% soln. of alkali hydroxide, carbonate, or bicarbonate.

Purifying mineral oils. H. W. HUTTON and F. J. MILNBANK. Brit. 153,857, May 20, 1920. After treatment with H_2SO_4 , mineral oils are mixed with about 15% of a sulfonated fatty oil, such as sulfo-castor oil, in order to remove the sulfo acids from the mineral oil. The sulfonated oil may be added with the alkali, or before or after its addition.

Cracking and purifying oils. N. V. S. KNIBBS. Brit. 154,464, Dec. 20, 1919. Hydrocarbon oils are purified or cracked and purified by heating in presence of Na or other alkali metal or of an alkali amalgam or alloy such as Na-Pb alloy. The oil and metal may be heated in an autoclave and the oil afterwards distd. in the presence or not of the metal; the oil vapor may be passed through the molten metal, or the oil may be fractionated or cracked from a still or retort containing the metal. The process may be continuous or intermittent, and the distn. may be carried out at, above, or below atm. pressure.

Distilling hydrocarbons, alcohol, etc. I. GRANGER, C. MARILLER and SOC. ANON. D'EXPLOITATION DE PROCÉDES ÉVAPORATOIRES (SYSTÈME PRACHÉ ET BOUILLON). Brit. 154,568, June 3, 1920. The condensation of vapors in app. for distg. crude mineral oils, volatile hydrocarbons, alcoholic liquids, etc., is utilized to generate steam which may be used for heating or power producing. When liquids with a b. p. lower than H_2O are distd, steam is generated under reduced pressure and may be compressed. A suitable app. is specified.

Cracking hydrocarbons. R. D. GEORGE. Brit. 151,925, Sept. 14, 1920. In decomposing heavy hydrocarbon oils to yield lighter oils by heating them under pressure, the free C which is formed is continuously removed. The oil is heated in a furnace-heated vertical still, 30, containing a rotary scraper, 44, and kept normally full of oil. Vapors and oil from the still pass up a pipe, 50, to a segg. chamber, 14, from which the oil passes by a pipe 54, to an insulated vessel, 22, in which the oil rises slowly and passes through a screen, 24. The suspended C deposits in the vessel or is retained by the screen. The oil returns to the still by a pipe, 26. The vapors may be passed from the chamber 14 by a pipe, 56, to a chamber, 12, in which the temp. is controlled by passing the oil supply through a greater or less length of the coil 10. The heavy oils condensed in chamber 12 are passed by a pipe, 60, into the vessel 22 and the vapors pass to a condenser, 64. The oil supply may be preheated by passage through the coil 10 and a coil, 16, in chamber 14 and is admitted to the vessel 22 by a pipe, 18. The bases of the vessel 22 and the still 30 are fitted with blow-off cocks 70, 74 to remove deposited C. The circulation of the oil between the still 30, the separator 14, and the C-removing vessel 22 may be assisted by a pump. The pressure within the circuit is maintained between 60 and 120 lbs. per sq. in., and the temp. between 370° and 450°.



Cracking hydrocarbons. F. A. KORMANN. Brit. 153,654, Aug. 6, 1919. In order to convert liquid hydrocarbons of high b. p. into hydrocarbons of lower b. p., a previously heated porous or capillary body is impregnated with the hydrocarbon at a lower temp., the capillary passages being thus caused to contract and subject the confined hydrocarbon to pressure, and the porous body is again heated to drive off the hydrocarbons. The operation is effected in a retort containing porous bricks made from shale clay or from a mixt. of shale clay, bone and willow charcoal. After the bricks have been heated to about 500° F., the hydrocarbon is forced into the retort through a spray pipe under a steam pressure of about 40 lbs. per sq. in. When the bricks are satd., steam from a superheater is admitted by perforated pipes at a temp. about 100° F. above the end b. p. of the hydrocarbon, and the hydrocarbons are driven off to a condenser. Cf. C. A. 14, 1215.

Cracking hydrocarbon oils. V. L. EMERSON. U. S. 1,367,806-7, Feb. 8. Streams of hydrocarbon oil to be cracked are forced against each other through opposed jets from which the oil issues under very high velocity and to the concussive impact of the oil particles against each other is attributed dissociative effects upon the oil. An app. is described.

Distilling and cracking oils. A. J. PARIS, JR. U. S. 1,367,828, Feb. 8. Hydrocarbon gas and oil, *e. g.*, a mixt. of natural gas and petroleum, is introduced directly into a body of molten Pb or similar molten metal to effect cracking of the oil by the heat and pressure of the metal.

Converting mineral oils into higher boiling products. W. NORN. Ger. 319,123, Mar. 2, 1917. The oils are heated with C under very high hydraulic pressure to high temps. E. g., paraffin oil, in which solid paraffin cannot be detected, is treated for 1 hr. with finely ground gas coke under a pressure of about 400 atm. at 300°. The yield of soft paraffin, m. 38.5°, is 20%. CuO is added to take up the liberated H.

Rotary indicating table for interpreting tests of asphalt. L. M. LAW. U. S. 1,366,572, Jan. 25. The table is marked with legends to indicate from a penetration test the suitability of different grades of asphalt for different conditions of construction and use, by a series of concentric rotating disks.

23—CELLULOSE AND PAPER

A. D. LITTLE

The advance in the paper and cellulose industry during the last twenty years. JOS. SATOPLET. *Chem. Listy* 14, 19-22, 50-3, 65-6, 84-5, 99-101, 116-7, 127-30, 152-5, 179-81, 201-6(1920).—An extensive review. JOHN M. KRNO

The study of magnesium carbonate from a paper-making point of view. ANON. *Papeterie* 42, 1021-2, 1065-9, 1114-8(1920).—Com. magnesium carbonate is a hydrated basic carbonate, the compn. of which varies according to the conditions of pptn. (temp. and time of boiling). Three carbonates are known: (1) $3\text{CO}_2 \cdot 4\text{MgO} \cdot 4\text{H}_2\text{O}$ (Wurtz); (2) $4\text{CO}_2 \cdot 5\text{MgO} \cdot 5\text{H}_2\text{O}$ (Fristzche); (3) $5\text{MgCO}_3 \cdot 2\text{Mg}(\text{OH})_2 \cdot 7\text{H}_2\text{O}$ (Carré, *Précis de chimie industrielle*). In the manuf. of cigaret papers it is important that the ash should be high, and for this purpose (1) is most suitable. It also possesses the advantage of being the lightest of the 3, and hence is more easily incorporated into the pulp and is more readily retained in the finished paper. Methods of detg. the "apparent density," the compn. of the carbonate, and the impurities which may be present are described in detail. A. P.-C.

Pasteboard. W. FUCHS. *Deut. Färber-Ztg.* 57, 27-8(1921).—The resistance of pasteboard depends upon the thickness and upon the presence of compds. with which the pasteboard is impregnated. For the latter purpose Cu, Al, Zn and other salts are dissolved in the paste, china clay is added in the solid form, and PbSO_4 is formed in the paste by the reaction of sol. Pb salts and sulfates. For white pasteboard without Pb, the following are recommended: (1) China clay 300 g., H_2O 300, CuSO_4 100, $\text{Cu}(\text{NO}_3)_2$ 50, gum arabic soln 1:1, 350. (2) China clay 400, verdigris 125, gum arabic 175, CuSO_4 175, alum 25, after making this up add K_2CrO_4 12 and turpentine 5. (3) China clay 1000, verdigris 300, gum arabic 500, CuSO_4 50% soln. 500, alum 250. In making up (2) or (3) the china clay, verdigris and gum arabic should be separately treated with water the day before, the verdigris in water acidified with AcOH . CuSO_4 and alum are dissolved in the hot gum arabic soln. The china clay and verdigris are kneaded together, the solns. added, the mass is cooled and passed through a sieve. For white or yellow board containing Pb use (1) china clay 200, water 200, CuSO_4 100, $\text{Pb}(\text{NO}_3)_2$ 100, PbSO_4 (50% paste) 200, gum arabic soln. 1:1 200, or (2) china clay 60, verdigris 30, alum 20, CuSO_4 20, $\text{Pb}(\text{NO}_3)_2$ 50, $\text{Pb}(\text{AcO})_2$ 40, gum arabic soln. 1:1.25. This should be compounded like Nos. 2 and 3 above, then the $\text{Pb}(\text{NO}_3)_2$ and lastly the $\text{Pb}(\text{AcO})_2$ added. Recipes with detailed directions are given for the prepn. of yellow, orange, green, olive, red and blue resists. L. W. RIGGS

The application of electricity to paper mills. F. E. FULLER. *Electrician* 86, 171-4(1921).—A detailed illustrated account of modern English paper mills. Among the topics considered are the potcher, the beating process, jordans, and strainers. Canada and Norway pulp is used. C. G. F.

X-ray spectroscopic investigations on cellulose (HERZOG, JANCKE) 3. Drying cylinders (Brit. pat. 154,508) 1.

DUBOSC, ANDRÉ: Les éthers cellulosiques. Première Partie. Les éthers minéraux et la cellulose. Vol. I. La nitrocellulose et le celluloïd. Paris: A.-D. Cillard. 344 pp.

Paper manufacture. R. JENNISON and J. P. DE CHANAZ. Brit. 154,366, Sept. 9, 1919. In making sized, transparent, and grease-proof paper, from wood pulp and similar cellulosic material, up to 20% or more of starch or other farinaceous material and to 5% or more of NaOH are added to the pulp in the pulp beater, and, after beating, the NaOH is neutralized with alum or other suitable agent. According to the provisional specification, up to 80% of starch may be used, the NaOH being proportionally increased, and mineral or other acid may be used to neutralize the NaOH.

Obtaining fibers. Y. HASHIMOTO. Brit. 153,804, Jan. 13, 1920. Fiber suitable for paper making and as a substitute for cotton is obtained from Sugamo (*Phyllospadix scouleri* Hook.), a kind of seaweed similar to bell-ware, eel-grass or wrack grass, by treating with lime water, boiling, washed with H₂O, treating with NaHSO₄, boiling washing and exorciating.

Coating paper with paraffin. G. W. MILES. U. S. 1,367,274, Feb. 1. Paper is rendered water-resistant by treating it with an emulsion of paraffin or other wax and depositing minute particles of paraffin or wax on the paper stock from the emulsion by pptn. with alum and rosin size.

Cardboard from aquatic plants. I. POMORSKI. U. S. 1,367,279, Feb. 1. Aquatic plants such as weeds or plantains are boiled in H₂O, coloring matter is added to the boiling mass and the resulting pulp is calendered to form cardboard.

Fibrous pulp from wood. F. K. L. SCHOUTEN. U. S. 1,367,895, Feb. 8. Wood is ground with such a small quantity of H₂O that the formation of a pasty mass is avoided and the frictional heat developed during the grinding is exclusively utilized for evap. moisture from the material so as to obtain the latter in fibrous condition for use in making paper or linoleum.

Apparatus for washing paper-making pulp. S. MILNE. U. S. 1,367,707, Feb. 8.

Cellulose acetate. H. DREYFUS. Brit. 154,334, Aug. 26, 1919. In the manuf. of solns., celluloid-like masses, films, dopes, artificial silk and other compns., and preps. and articles having a basis of cellulose acetate, the following high boiling or plasticity-inducing agents are employed: C₆H₅SO₂NHMe, C₆H₅SO₂NEtMe, mixts. of dimethyl-, diethyl-, or ethylmethylsulfonamides of *o*- and *p*-toluene or of the isomeric xylenes, or mixts. of these dialkylsulfonamides and the monoalkylsulfonamides referred to above or in 132,283 (C. A. 14, 346), and 133,353, may be used. In conjunction with these high boiling solvents, there may be used any other suitable low boiling solvents, agents such as triphenyl or tricresyl phosphate, acid-neutralizing aliphatic derivs. of urea such as mono-, di-, or trimethyl- or triethylurea, coloring matters and filling materials. Methylbenzenesulfonamide may be prepd. from com. benzene, *e. g.*, distg. between 79–80°; the sulfonyl chloride is first prepd. and then treated either with NH₃ and afterward with suitable alkylating agents, or directly with suitable amines; the mixts. of *o*- and *p*-dialkylsulfonamides, from com. toluene distg. between 95 and 132°; the dialkyl-*o*-toluenesulfonamides, from pure toluene distg. between 110 and 111°; the mixts. of isomeric dialkylxylene sulfonamides, from com. xylene distg. between 135 and 146°. Cf. C. A. 14, 3792.

Viscose. R. MULLER. Brit. 153,444, Oct. 9, 1919. In a cyclic process for the manuf. of artificial threads, films, etc., from viscose, a soln. of the latter is prepd. with

NaOH obtained electrolytically, the H and Cl from the electrolytic cell are united, as e. g. in an explosion motor, to form HCl, which, with the addition of NaCl if necessary, constitutes the pptg. bath, and the NaCl regenerated during the pptn. is returned to the electrolytic cell.

Treating sulfite back waters. R. H. MCKEE. *Norw.* 30,939, July 26, 1920. Before fermenting the liquor, the sulfite is pptd. by the addition of Ba compds. with simultaneous oxidation, so that BaSO₄ is formed. BaS serves as the Ba compd.

Cleaning metal screens of nitrocellulose. R. G. WOODBRIDGE, JR. U. S. 1,367,111, Feb. 1. Metal screens through which nitrocellulose compns. have been passed and which may be formed of steel, Cu, brass or similar metal are cleaned without appreciable damage to the metal by treatment with a soln. formed of caustic alkali or alkali metal sulfide or carbonate or other reagent for decomposing the nitrocellulose.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Casinghead gasoline explosion at Memphis, Tenn. B. W. DUNN. *Bur. of Explosives, Special Bull.* No. 3, Feb. 10, 1921, 18 pp.—This is a well prepared and illustrated account of the disastrous explosion at Memphis on Jan. 24, 1921, following the opening of one of two tank cars containing casinghead gasoline. The immediate cause was the removal of the dome cover while interior pressure existed in the tank by which an inflammable and explosive mixt. was formed and projected into surrounding buildings where ignition was effected from contact with fires normally burning there. This removal was in violation of I. C. C. regulations and this accident was the 16th example of the results that may follow removal of a dome cover while interior pressure exists in a tank car. Copies of B. E. rules and instructions on handling gasoline are appended.

CHARLES E. MUNROE

The behavior of explosive gas mixtures under reduced pressures. A. STAVENHAGEN AND E. SCHUCHARD. *Z. angew. Chem.* 33, I, 286-7(1920).—The expts. were carried out with H + O mixts. in a Hofmann lecture eudiometer of about 250 cc. capacity, having legs 2.5 m. long by 12 mm. in diam., the graduated tube being supplied with Pt leads introduced directly beneath and 150 mm. below the three-way stopcock. It was found that if the pressure on an explosive gas mixt. was reduced sufficiently no explosion ensued on the passage of a spark, but by gradually increasing the pressure a point was reached when explosion took place. This was styled the "critical ignition pressure." Only a part of the H and O in the mixt. reacts under these conditions, but by further increase of pressure a second explosion could be produced; this was repeated 5 times for the same original portion of mixt., the explosions being accompanied by a glow whose intensity and extent appeared to depend on the degree to which the reaction had previously been carried. If the pressure was diminished below the critical ignition pressure and the arc prolonged, say for a minute, slow combustion, without explosion, took place as evidenced by the reduction in vol. It is concluded that (1) when the pressure on an explosive gas mixt. is below a certain limit the mixt. is not ignited and such mixts., therefore, possess a critical ignition pressure; (2) with decreasing pressure the intensity of the explosion is diminished, that is the velocity of propagation of the explosion flame decreases with the pressure; (3) with pressures below the critical ignition pressure slow and flameless combination takes place, the amt. of gases combining being the greater the nearer the pressure approaches the critical ignition pressure; (4) the critical ignition pressure is detd. by the compn. of the gases, the proportions in which they are mixed, the humidity, and the given initial impulse; (5) a previous explosion in a closed space does not preclude the possibility of later explosions if there

results no additional change in the proportion of the mixt.; (6) the possibility of after-explosions is the greater the less the pressure from the first explosion or the more the pressure is reduced by the first explosion through diminution in vol. Cf. *C. A.* 14, 1221, 3157, 3512, 3796.

CHARLES E. MUNROE

Ignition of fire-engine hose when in use. A. H. GILL. *J. Ind. Eng. Chem.* 13, 168(1921).—When cold water was being pumped through a 50-ft. length of new 2.5 in. hose at the rate of 250 gal. per min. the hose took fire and a hole 2 by 1.12 in. in diam. was burned through the 2 cotton jackets of the rubber-lined hose. G. found this to be due to heat from friction between the cotton casings produced by the vibrations of the hose in service.

CHARLES E. MUNROE

First report of the commissioner of the department of public safety for year ending November 20, 1920. A. F. FOOTE. *Mass. Pub. Doc.* No. 32, 88 pp.(1921).—The department embraces a division of fire prevention, bureau of explosives and inflammables, and a bureau for the storage of liquids. This first report contains chiefly statistics of inspections and tests. It is recommended that CaC_2 and similar substances be made subject to regulation.

CHARLES E. MUNROE

Fire in a solvent recovery house. T. H. CROZIER. *Special Rept. H. M. Insp. Exp.* No. 238, Dec. 28, 1920, 4 pp.—The accident occurred in a vacuum stove used for recovery of C_6H_6 and acetone from a sporting smokeless powder at the Tonbridge Works of Curtis and Harvey during unloading of the stove. The stove was supplied with hollow Fe shelves in which steam circulated and on which trays, each made of a piece of uraltite fitted with a wooden rim to retain the explosive, were placed. The stove closed hermetically so that vacuum as well as heat was employed for removal of the solvent. When the vacuum reached a certain height air was admitted to the stove, the door opened and the trays pulled. It was during this operation that the flash producing this disaster occurred, and it appears to have been due to friction of a tray on warm dry nitrocellulose dust on an Fe shelf. To prevent a recurrence it is proposed that steam as well as air be blown in to break the vacuum and render the powder and dust humid; that a door be provided at the back as well as at the front of the stove to permit of a more thorough inspection and complete cleansing of the stove; that trays $\frac{1}{2}$ the length of the present ones be used to reduce the load and friction; and that a pair of brass wheels be put on the back end of each tray, so that in unloading the front would be raised and the tray rolled out.

CHARLES E. MUNROE

Modification of Lunge's nitrometer (BLECHTA) 1. Formation of 2,3,6-trinitrotoluene in the nitration of toluene (DREW) 10. Recovering volatile solvents (U. S. pat. 1,367,009) 13.

Explosive. A. LANGMEIER. U. S. 1,367,608, Feb. 8. An explosive adapted for use in blasting is formed of TNT 20, TNT-coated NH_4ClO_4 20, TNT-coated NaNO_3 49, wood pulp 1 and S 10 parts.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Dyes and textile industry. W. J. U. WOOLCOCK. *Chem. News* 121, 284-5(1920).—W., a member of Parliament, gave an address on the dye and textile situation in England with special reference to aiding the dye industry. Tariff, subsidy, state purchase and sale bureau, licensing plus a tariff, and licensing were severally discussed. The last is considered least objectionable.

L. W. RIGGS

The international policies of the American dyestuff industry. L. W. ALWYN-SCHMIDT. *Color Trade J.* 8, 1-3(1921). E. J. C.

Organization and construction of dye houses. A. W. BENNETT. *Mech. Eng.* 42, 673-4, 706(1920); *Chem. Age (N. Y.)* 28, 470-4(1920).—See C. A. 15, 757.

E. J. C.
Manufacture of naphthol yellow S. J. E. WYNFIELD RHODES. *Chem. Age (London)* 4, 16(1920).— α -Naphthol is first sulfonated to form the trisulfonic acid, and the product after cooling immediately nitrated with moderately strong HNO_3 , yielding dinitro- α -naphtholmonosulfonic acid, the Na salt of which is Naphthol Yellow S. Rustless steel is best for the pans, which may be heated by gas, steam or fire. For a 50-gal. pan, 80 lbs. dry crude α -naphthol are stirred into 320 lbs. H_2SO_4 , 168°Tw . at 100° , the temp. is raised to 120° and held there 3.5 hrs. The charge is then run, siphoned or blown, according to the construction of the plant, into 48 gal. water. Temp. control is the most important factor. The cryst. naphthol yellow free acid is filtered through "Filtros" tiles, the filter cake is dissolved with Na_2CO_3 , and immediately salted out, vacuum-filtered, dried at 80° , ground and packed.

L. W. RIGGS
Gloria effects in dyeing wool and silk. ALBERT WINTER. *Deut. Färber-Ztg.* 57, 63(1921).—The dyes used should have a greater affinity for silk than for wool, but show a greater absorption with wool than with silk. Also dyes should be chosen which dye wool at boiling temp. but not silk. By such a selection the wool in combination with the silk may be dyed at boiling, then treated with a dil. soap bath which removes most of the dye from the silk when the latter may be dyed at 50° to 55° . L. W. RIGGS

Bleaching with hyposulfite in the wet wash. WILH. ALBERT. *Deut. Färber-Ztg.* 57, 6(1921).—The various hyposulfite preps., e. g., "Burmol" are well adapted to the bleaching of wool silk or plant fibers in the wet wash. Stains which are not removed by water, alkalis or acids, are often removed by local treatment with hyposulfite after the acid has been completely washed out. Treatment, repeated if necessary, with 25% ammonia and KMnO_4 soln. followed in a few min. by "Burmol" soln. until the color is discharged often works well. After the spots are removed the goods should be thoroughly washed, acidified 15 to 20 min. with 2% $(\text{COOH})_2$ and 1% H_2SO_4 in a bath at 30° , and again washed. "Hyraldit Z" (Cassella) may be used, in place of "Burmol," with 2% HCOOH or H_2SO_4 , followed by 2% $(\text{COOH})_2$ and washing. L. W. RIGGS

The retting of bast fibers. V. PAUL KRAIS. *Z. angew. Chem.* 33, I, 277-8 (1920); cf. C. A. 13, 2266, 2764.—The use of borax instead of NaHCO_3 in the "safety-process" of retting is not permissible in the case of a Brazilian mallow, as no signs retting were observed even after 75 hrs. Water alone was as effective as 0.1 or 0.2 N NaHCO_3 soln. for this material. Borax checked the process in the case of a sample of nettles and two samples of flax. The development of the nettle as a cultivated crop in Germany for the production of textile fibers is impossible, at least until nettles with a higher yield of fiber are produced and the problems connected with cultivation are solved. The utilization of wild nettles on a large scale has failed because of the difficulties of transportation, lack of uniform quality and uncertain quantity. Some benefit can be gained by pregg. and utilizing fibers in German households, or by supplying the harvested and dried plants to local spinning mills. All processes which yield a silky, white fiber are to be avoided, since in the subsequent processes such fibers felt and tangle, thus causing excessive losses on the cards. Nettles contain much more acid than flax; and should not be retted without the addition of some alkali to the H_2O . An 0.8% soln. of NaHCO_3 at 37° gives a perfectly retted product in 48-60 hrs. A 0.5% soln. of Na_2CO_3 requires somewhat more time. Addition of CaCO_3 makes possible a reduction of $1/2$ of the alk. material used, but the fibers are dusty. The retted ma-

terial should be dry for the breaking process. From 100 parts by wt. of air-dry stems of nettles, there is obtained 81.5 parts of retted material, and from this, 8.15 parts of dry crude fiber. The yield of pure fibers is about 5.5 parts, the losses being caused by bowking and bleaching. The leaves of the nettle-plant make an excellent fodder. The refuse from the breaking process can be used as litter or can be burned.

W. F. FARAGHER

The development of bowking methods and equipment in the textile industry. F. H. THIMS. *Chem.-Zig.* 44, 949-51 (1920).—Although the literature contains considerable material on the chem. side of bowking, only disconnected, uncritical descriptions of some types of the equipment used are found. A better understanding of the whole process is dependent upon a deeper understanding of the developments leading to the present-day app. "For, however the bowking is done, whether in concd. or dil. solns., whether lime, strontia, soda, soap or NaOH is used, or whether or not pressure is used, the nature of the process is little influenced, since it is more largely a question of mechanical cleansing-processes than of chem. reactions." Descriptions of the types of app. used since that of Persoz (about 1846) are discussed briefly. W. F. F.

Notes on raw silk specifications and testing. W. F. EDWARDS. *Textile World J.* 58, 4167-9 (1920).—"Synopsis of items with a tentative 4-group grading."

CHAS. E. MULLIN

The action of atmospheric influences on wool. A. KERTESZ. *Textile American* 33, No. 2, 18-9 (1920).—See C. A. 14, 1760. Translation and comments by C. M. Whittaker.

CHAS. E. MULLIN

Valuation of sodium hyposulfite (CROWTHER, HEYWOOD) 7. The preparation and technical uses of furfural (MONROE) 10. Recovering volatile solvents (U. S. pat. 1,367,009) 13. Phenol-aldehyde condensation products (Brit. pat. 153,796) 18.

SISLEY, P.: Unification des noms des colorants les plus usuels. Paris: Union des Producteurs et des Consommateurs pour le Développement de l'Industrie des Matières Colorantes en France, 53 Rue de Chateaudun.

"Dye substitute." A. L. CLAPP. U. S. 1,367,862, Feb. 8. A soln. for producing a brown color on cloth, paper, pulp or leather is formed by dissolving leather 100 lbs. in a hot soln. of NaOH 15 lbs. in H₂O 1000 qts. Dyes may be added to change the color produced.

Selective dye for silk and wool. S. M. TOOTAL. U. S. 1,367,930, Feb. 8. A prepn. for dyeing silk or wool in mixed goods without affecting cotton is formed of a weakly acid dye such as xylene red or ketone green, a gelatinous substance such as gelatin or glue and HOAc or other weak org. acid.

Apparatus for dyeing yarn in hanks. A. ASHWORTH. U. S. 1,367,112, Feb. 1.

Apparatus for circulating liquids over hanks of yarn. E. NÄGELIN. U. S. 1,367,494, Feb. 1.

Threads from viscose. C. A. HUTTINGER and E. RITTENHOUSE. U. S. 1,367,603, Feb. 8. Viscose is introduced in multiple streams into a pptg. bath composed of NaHSO₄, H₂O and molasses and the resulting filaments are spun to produce a soft and open thread.

Protecting bags or other fabrics from chemical corrosion. A. BRUNO. U. S. 1,367,177, Feb. 1. Protection of fabrics such as bags formed of woven fabrics against corrosive action of acid fertilizers or other similar materials, is afforded by impregnating the fabric with a mixt. of finely ground chalk with glue or gelatin and then treating with alum, tannin or CH₂O.

Application of degradation products of albuminous substances. C. BENNETT. Ger. 330,133, Dec. 25, 1915. See Brit. 145,674 (C. A. 14, 3536).

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The Ostwald color-system and the manufacture of pigments for book-printing and lithographing. ROBERT FISCHER. Leipzig. *Z. angew. Chem.* 33, I, 299(1920).—There can be no doubt that the Ostwald color system promises to be of fundamental importance in the field of printing inks. Its service to the dye-industry is already recognized. Matching will be greatly simplified, and made more accurate. Ordering of pigments at different times and from different sources will be possible with assurance of obtaining the shades desired. A further advantage is the choosing of color combinations which will harmonize properly. Many problems must be solved before the full utility of the system is realized. Some of the difficulties are as follows: The Ostwald color standards are made with pure dyes on grounds which are not similar to those used in book printing. The requirements of fastness to light, of transparency or of covering power, of the suitability of the ink for a specific process or for a definite kind of paper, will probably make necessary the prepn. of a properly graded series of suitable color norms. The influence of the different kinds of vehicles for the colors upon the shade printed must be investigated.

W. F. FARAGHER

The testing of glue for use as binder in distemper. HUGO HILLIG. *Farben-Zig.* 26, 723-4, 779-80(1921).—The adaptability of glue for use in H₂O-paints is best judged by the characteristics of the dry glue; it should not be hygroscopic nor brittle, should dissolve easily, etc. The quantity of glue necessary to produce a good adhesive paint coat can be detd. only by expt., preferably with ocher, which mixes readily and requires a normal amt. of glue. English vermilion and whiting require a high, and ZnO requires a low glue content in the vehicle to produce proper adhesion. F. A. W.

Bactericidal and fungus-resisting paints. HENRY A. GARDNER. Paint Mfrs. Assoc. of U. S., *Circ.* No. 115, 8 pp.(Feb., 1921).—Fungous growths of mildew which discolor paint films not only are prevalent in Southern climates but are found during favorable weather conditions in the North. They are caused by the use of low-grade, infected linseed oils, by soft paint films to which spores and other foreign matter adhere, and by painting on wood already infected with mildew. They may be avoided by using high-grade linseed oil free from foots; selecting pigment mixts. such as those contg. ZnO, which produce hard films; selecting hard drying vehicles if the color of the paint does not permit addition of ZnO; adding a small amt. of Hg salts to the ready mixed paint; or if the unpainted wood is infected, by treating it with NaF. The vapors from drying paints have a bactericidal effect, probably on account of the small amt. of HCHO formed. Painting of rooms previously occupied by patients with contagious diseases is, therefore, desirable. Illus.

F. A. WERTZ

Qualitative test for determining the texture of pigments. H. A. GARDNER and R. E. COLEMAN. Paint Mfrs. Assoc. U. S., *Circ.* No 117, 6 pp.(Feb., 1921).—The property of many pigments to disperse readily when mixed with a liquid is due to their texture, and closely related to the texture of a pigment are ease of grinding, character of finish, settling and hardening in the package, and to some extent flowing and spreading of the paint. A test for detg. comparative textures of pigments consists in rubbing up on a glass plate under a muller, 1-2 g. of the pigment, dependent on its oil absorption, with a sufficient quantity of blown linseed oil (d. 0.945-0.95) thinned with turpentine to a viscosity slightly higher than that of raw linseed oil. The paste is rubbed out in 3 mulling operations of 1 min. each, and is then transferred to a beaker and thinned

with a total of 12 cc. of the blown oil-turps mixt. The paint is flowed on to a clean glass plate, which is then placed vertically and allowed to drain. If the individual pigment particles are visible in the upper portion of the film, the pigment does not have a soft texture. Differences in texture are easily observed by the test. If the same pigment is used with different liquids, the relative dispersing properties of the latter can be detd. The circular is illustrated.

F. A. WERTZ

Rubber-seed oil, and a method of producing glycerides from fatty acids. HENRY A. GARDNER. *Paint Mfrs. Assoc. U. S., Circ. No. 118*, 2 pp. (Feb., 1921).—Detns. on 2 authentic samples of rubber-seed oil gave: d_{15.5} 0.924, acid no. 56, sapon. no. 193, I no. 138, hexabromides 16.3% equiv. to 6% linolenic acid in the total fatty acids. On addition of Co drier, the oil dried very slowly, probably on account of the high free fatty acid content. On heating 50 g. of the crude oil with 2 g. C₂H₅(OH)₂ and 3 g. Ca rosinate to 260° for 90 min., its acid no. was reduced to 5.1. This esterified oil, on addition of the same amt. of Co drier as before, dried overnight to a film firmer than that produced by soy oil. Similar esterification with C₂H₅(OH)₂, using Ca soaps as catalyst, might be of value in overcoming the slow drying of oils of high fatty acidity such as highly refined linseed, soy, and cottonseed oils.

F. A. WERTZ

An instrument for measuring the hiding power of paints. R. L. HALLETT. *Proc. Am. Soc. Testing Materials* 20, II, 426-39 (1920).—See *C. A.* 14, 2863. E. J. C.

Preparation of water-colors and stamping-inks. ALPONS LANGER. *Chem.-Ztg.* 44, 951-2 (1920).—A general discussion is given of the usual methods and materials used.

W. F. FARAGHER

Developments in the tung oil heat test and examination of new samples of tung oil. HENRY A. GARDNER. *Paint Mfrs. Assoc. U. S., Circ. No. 119*, 8 pp. (Feb., 1921).—To verify the results obtained by Jameson (*C. A.* 14, 3804) on the effect of the free fatty acid content of tung oil on the Browne heat test (*C. A.* 10, 974), G. exptd. with pure oil from China and with commercial oils. Removal of free fatty acids with Ca(OH)₂ in each case reduced the time in the heat test by about 1.5 min. Check detns. were more easily obtained on the neutralized than on the original oils. Adding varying amts. of pure tung-oil fatty acids to a neutralized oil, and then plotting % fatty acid against time in min. for the Browne heat test, produces a nearly straight curve. A neutralized oil to which sufficient tung-oil acids have been added to produce the same free acid content as was present in the original raw oil, does not show the same time in the heat test as the latter. The decided drop in the heat test no. of min. when oil is treated with Ca(OH)₂ is, therefore, not wholly due to removal of free fatty acids. Jameson's article is reprinted.

F. A. WERTZ

Tentative revision of standard specifications for purity of raw tung oil. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 819-22 (1920).—A method and app. for the heating test to replace Browne's method are described.

E. H.

New synthetic alcohols and their use in the lacquer industry. WALTHER SCHRAUTH. *Farben-Ztg.* 26, 647-8 (1920).—The shortage of lacquer solvents in Germany has been relieved by the production of Me₂CO, and then isopropyl alc. and its esters, from C₆H₆ and of cyclohexanol and its esters from phenols. D., b. p., flash pt., evapn. rates, etc., of a number of these products are tabulated. Cyclohexanol and its homologs evap. more slowly than amyl acetate, and produce nitrocellulose solns. of very much greater viscosity, but these disadvantages may be overcome by using mixed solvents.

F. A. WERTZ

The detection of rosin and its derivatives in oil varnishes. HANS WOLFF. *Farben-Ztg.* 26, 648-9 (1920).—Boiled linseed oils, esp. in the presence of Mn driers, sometimes give a color reaction with the Storch-Morawski reaction, which is suspiciously like that of rosin. Oxidized oils often mask this reaction, and highly heated rosin and esters

do not produce the characteristic color. The presence of rosin can be established with greater certainty by isolating the rosin acids from the varnish. Dissolve 5 g. varnish in 150 cc. Et_2O , filter, shake out twice with 250-cc. portions of 1% $(\text{NH}_4)_2\text{CO}_3$ soln. Acidify the ext. with HCl , and dissolve the sepd. rosin acids in Et_2O . Evap. and dissolve the acids in 10 parts benzene. Test 3 or 4 drops of this soln. by the Storch reaction, and to the remainder add 1 to 2 drops of NH_4OH . Rosin is present only when the unmistakable violet color is produced, and when the soln. gelatinizes on addition of NH_4OH . If both these reactions are not positive, ext. the varnish soln., previously treated with $(\text{NH}_4)_2\text{CO}_3$, with 3 portions of 200 cc. each 1% NaOH ; acidify the ext. and remove rosin acids. Test these as before. Rosin is absent if both tests are not positive. Expts. show that this procedure will detect rosin in whatever form it exists, except that if it is in the highly improbable form of an absolutely neutral ester the varnish should be saponified, the fatty-rosin acid mixt. esterified, and the tests made on the sepd. rosin acids. An approx. quant. detn. of rosin may be made by weighing the NH_4 salt.

F. A. WERTZ

The manufacture of lithopone. STEINAU. *Chem.-Ztg.* 44, 974-5(1920).—Review.

F. A. WERTZ

Colloidal rosin. WILHELM POLLMANN. *Chem.-Ztg.* 44, 976-7(1920).—The "Rohstoff-Veredelungs-Gesellschaft" of Hamburg has succeeded in converting raw rosin into the colloidal condition by means of the Plauson method (*C. A.* 14, 3129). The operation is very inexpensive and recovers turpentine and all volatile portions of the raw rosin (no details given). The colloidal rosin is marketed as a dark liquid of consistency varying from that of H_2O to a heavy sirup; it contains some alkali; is miscible with H_2O in all proportions; and is particularly adaptable to the manuf. of soaps, paper, shoe polishes, floor waxes, etc. It does not burn even when a flame is directed against it. When used in soap manuf. it saponifies extremely readily, gives high yields and best quality solid or liquid soaps that lather freely. Paint and varnish products made with the rosin are H_2O -miscible, and produce a hard film of very high gloss. The rosin is also used to manuf. buttons, electrical insulating app., etc., by pressure molding.

F. A. WERTZ

Tentative specifications for primer for use with asphalt for use in damp-proofing and waterproofing. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 720(1920).

E. H.

Tentative specifications for creosote oil for priming coat with coal-tar pitch for use in damp-proofing and waterproofing. ANON. *Proc. Am. Soc. Testing Materials* 20, Part I, 725-6(1920).

E. H.

Fibrous pulp from wood (U. S. pat. 1,367,895) 23. Constituents of resins (ZINCKE, *et al.*) 10. The preparation and technical uses of furfural (MONROE) 10.

Paint. J. W. MURPHY. U. S. 1,367,888, Feb. 8. A paint adapted for use on wood, metal or other material is formed of Al or other metallic powder 3, japan 2 and turpentine 4 parts.

Paint for iron or steel. J. H. GRAVELL. U. S. 1,367,597, Feb. 8. A paint for preventing rusting of Fe or steel is formed of pptd. Ca phosphate mixed with oil.

Solidified oil compositions. B. SCOBEL. Brit. 153,942, Aug. 5, 1919. Tung oil or Chinese wood oil is solidified by the action of halide salts, particularly chlorides, uniformly disseminated through the oil. To secure this dissemination, the chlorides are first ground up with an indifferent oil, such as resin oil or linseed oil, or dissolved in an anhydrous org. solvent, and the liquid produced is mixed with the tung oil. Suitable combinations of salts and solvents are anhydrous FeCl_3 in anhydrous acetone, an-

hydrous AlCl_3 in anhydrous acetone, anhydrous SnCl_4 in acetone, anhydrous ZnCl_2 in acetone or amyl alc., and Sb or Bi chloride in acetone; the use of FeBr_3 is also mentioned, and mixts. of various salts may be employed. Fuming chloride may be dissolved in benzine or the like and mixed with an indifferent oil and the mixt. added to the tung oil, or they may be changed into hydrated chloride and dissolved in anhydrous solvent and used directly. Filling and coloring matters, fibrous or otherwise, may also be added; a number of suitable and unsuitable substances are mentioned. Rosin gums, ester gums, or other gums easily sol. in oil may be added to the tung oil, as may tung oil fatty acids. Either raw or blown tung oil may be employed, but oil that has been partly polymerized by heat is unsuitable.

Ferric oxide and hydroxide. E. C. R. MARKS. Brit. 153,792, Dec. 9, 1919. $\text{Fe}(\text{OH})_3$ together with a small quantity of a basic salt, is continuously pptd. when air or other gaseous oxidizing agent is passed, under pressure, into a hot soln. of a ferrous or ferric salt, in which is suspended metallic Fe. The air, etc., is passed into the soln. through the perforated pipe and the soln. is kept at about 60° by means of the steam pipe, or by employing heated air or air together with steam for the oxidation of the Fe salt. When the ppt. has attained the desired color, it is filtered off and calcined to form red oxide, or just dried, for use as a pigment.

Balloon varnish. BALLONHÜLLEN-GEH. M. B. H. Ger. 321,264, Jan. 25, 1918. The reaction product of SiCl_2 and oils, after soln. in a suitable solvent and purification by washing, is added to the usual balloon varnish. E. g., the specified product is dissolved in amyl formate and washed with soda soln.

Antiseptic and preservative hard and quickly drying varnishes and color-binding agents. CHEM. FABRIK FLÖRSHEIM DR. H. NOERDLINGER. Ger. 320,656, Apr. 16, 1916. Pine tar is freed, by distn., from the constituents boiling below 200° , and the distn. residue is hardened or altered in the drier, and the product dissolved in the known manner to produce varnish. The distn. may be effected under reduced pressure, or in a current of air or steam. E. g., 1000 kg. light pine tar are distd. at $100\text{--}160^\circ$ with superheated steam, until oily constituents are no longer contained in the distillate. About 700 kg. of a viscous residue and about 200 kg. of a light distillate containing turpentine oil are obtained. The residue is hardened with 5% $\text{Ca}(\text{OH})_2$ at $160\text{--}200^\circ$, and then dissolved in the required amt. of a suitable solvent. The resulting varnishes are light to dark brown, dry rapidly and with a gloss, without being tacky, and exhibit antiseptic and preservative action on wood.

27—FATS, FATTY OILS AND SOAPS

R. SCHERUBEL

The fat-hardening industry in Switzerland. ANON. *Chem. Age (London)* 4, 180(1921).—Recent developments are discussed. E. J. C.

Cold-test apparatus for oils. G. H. P. LICHTHARDT. *J. Ind. Eng. Chem.* 13, 145-6(1921).—The app. consists of a galvanized-iron box $6'' \times 6'' \times 6''$ containing 9 glass tubes of 0.3" inside diam. bent at one end. The tubes are connected to an air supply through a regulator and the tank contains a freezing mixt. and an agitator. The sample of the oil is placed in the tube, the temp. is lowered until the oil does not flow under air pressure of 16" of water, and the temp. is then gradually raised until the oil appears in the tube outside of the box, this temp. being taken as "cold test." Accuracy of 0.15° is claimed. C. C. HERITAGE

Hydrogenation freed from patent monopoly. ANON. *Chem. Age (N. Y.)* 29, 33-6(1921).—A summary of the patent litigation of the Procter & Gamble Co. and the Berlin Mills Co. and the decision of the U. S. Supreme Court. E. H.

Investigations of sodium oleate solutions in the three physical states of curd, gel and sol (LAING, McBAIN) 2. Colloidal resin (for soap manufacture) (POLLMANN) 26. Liquid fuel; purifying oils, etc. (Brit. pat. 153,365) 21.

Extracting fat, etc., from sludges. A. J. STEPHENS. Brit. 153,608, Aug. 11, 1919. The wet sludge, with addition of H_2O if necessary to make it flow easily, is emulsified with gasoline or other solvent for the matter to be extd. which will cause the undissolved matter to float on the aq. soln. The resulting mixt. is centrifuged as in the machine described in 119,288. The gasoline is distd. from the extd. matter, and the H_2O and solid matters are treated with steam to recover any contained solvent. In an example, wool-scouring liquor is allowed to stand, and the supernatant liquor is drawn off and acidified with acid or niter cake; the semi-liquid sludge consisting of fine dirt, suspended grease, org. matter sol. in the alkali, and fatty acids from the soap is then treated as described above.

Purifying oils and fats. SOC. ROCCA, TASSY, ET DE ROUX. Brit. 153,887, June 28, 1920. In the removal of free fatty acids from oils and fats by treatment with alkali or alk. earth as soda or lime the oil or fat is treated while in soln. in a volatile solvent.

Refining oils and fats. K. H. VAKIL. Brit. 154,514, Feb. 26, 1920. In refining and removing fatty acids from vegetable, animal, and fish oils and fats as described in 155,020, the oil is heated to 220–300° F. by passage through a heat exchanger and an elec. heater, and is sprayed into a refining tower in which it meets an ascending current of CO_2 or of CO_2 and N heated, if necessary, by a heater. The partly refined oil may be circulated by a rotary pump and is discharged through the heat exchanger to a reservoir. The CO_2 and the vapors pass through a separator to a heat exchanger and thence, after admixt. with steam, in a jet to a condenser. Fatty acids condense and collect in receivers. The gases may be scrubbed with oil in a scrubber and are led to a gas-holder or are returned through the heat exchangers to the tower. Cooling-water passes first through a cooler through which the oil from the scrubber is circulated, then through the condenser and then through the heat exchanger.

Extracting and purifying oils. P. PARODI. Brit. 153,579, Nov. 6, 1920. Oils are extd. from berries, fruits, etc., by solvents, and the oil is sepd. and purified by distn. with steam and under reduced pressure. A suitable app. is specified.

Extracting oil from coconuts. W. ALEXANDER. U. S. 1,366,338, Jan. 25. Ground coconut meats are heated and pressed and a creamy emulsion is sepd. from the liquid obtained, by centrifugal sepn. This emulsion is inoculated with bacteria adapted to digest albumin and dry oil liberated from the H_2O and albumin sludge is centrifugally sepd.

Codliver oil. P. M. HEYERDAHL. U. S. 1,368,148, Feb. 8. Codliver or similar fish oils are refined by treatment with a current of H, N, CO_2 or H_2O vapor in the presence of sufficient H_2O in liquid form to wash the oil during the treatment. This treatment serves to improve the flavor of the oil.

Separating soap from solutions. M. H. ITTNER. U. S. 1,367,973, Feb. 8. In order to effect the sepn. of settled soap from strong solns. of soap in dil. lye, the material is subjected in a thin flowing condition to a continuous centrifugal sepn.

Cleansing compositions. C. C. BAKER and T. L. BONSALE. Brit. 153,684, July 10, 1919. A mixt. of 5.5 lb. of grease, saponified with 1 lb. of soda or potash lye $\frac{1}{2}$ pt. of kerosene, 3 lb. of sawdust, 4 gal. of H_2O and $\frac{1}{2}$ oz. of rosemary or other perfume is used as a detergent.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Further studies in the deterioration of sugars in storage. N. KOPELOFF, H. Z. E. PERKINS AND C. J. WELCOMB. Louisiana Agr. Expt. Sta. *J. Agr. Research* 20, 637-64(1921); cf. *C. A.* 14, 2562.—The sugars which were stored two months were Cuban with the exception of 2 Porto Rican. Tests for polarization, reducing sugar, H_2O , ash, number of microorganisms and molds were made after 30 days and 60 days storage. A decrease in polarization usually accompanied by an increase of reducing sugar and the large number of microorganisms where the H_2O ratios were highest were usually found. A correlation between deterioration and the number of microorganisms and between deterioration and the H_2O ratio makes it possible to predict the keeping qualities of sugar by a preliminary bacteriol. and chem. analysis. The temp. and relative humidity at New Orleans, La., during the storage period, also the differences between successive samplings of the sugars, are tabulated. The use of superheated steam in the centrifugal will reduce the number of microorganisms more than 90% and consequently may eliminate deterioration if the H_2O ratio is likewise properly controlled.

F. C. COOK

White sugar deterioration. W. D. HORNE. *Facts About Sugar* 12, 90-3(1921).—Observations are recorded on a comparison of plantation white and raw sugars constituting the usual commercial supply. The former show a marked tendency to ferment very easily when moistened and the deterioration goes on more rapidly than in ordinary raw sugars. H. ascribes this difference to bacterial contamination as well as the compn. of the films surrounding the sugar particles. The av. change of 10 deteriorating raw sugars was $-3.17^\circ V$; while an av. of 7 plantation white sugars with 2.5° higher polarization showed a loss of $8.07^\circ V$. However, the latter did not increase quite as much as the former in moisture content.

N. KOPELOFF

Refining raw sugars without bone-black. C. E. COATES. *J. Ind. Eng. Chem.* 13, 147-53(1921).—This is a general discussion of refining practices followed in late yrs. in La. sugar houses, with comments. With the present equipment of these houses the best yields that can be expected are about 2.5 lbs. less sugar and 3.5 lbs. more molasses per 100 lbs. of raw than obtained by the use of bone-black. Phosphatation, carbonatation and sulfitation have been used, also kieselguhr alone, and decolorizing C alone, or after kieselguhr treatment. No very accurate data on yields have been obtainable. The conclusion is drawn that with the processes better standardized, the sugar houses can be used profitably during the off season in refining raw sugars whenever there is a large enough margin between raws and refined.

F. W. ZERBAN

A critical study of methods for the determination of caramel in sugar-factory products. M. KAUFFMAN. *Arch. Suikerind.* 28, 2027-42(1920).—Caramel formation means loss of sucrose and also has a detrimental effect on the color of the sugar produced. K. has, therefore, made a careful study of the different methods proposed for its detn. The results obtained by the method of Fradiss (*Bull. assoc. chim. suc. dist.* 16, 280(1899)) are much too high, because MeOH dissolves sugars also which are repptd. by $CHCl_3$. Even if the sugars are first removed by fermentation the caramel appears to be still contaminated. Ehrlich's original method (*C. A.* 3, 2881) is not applicable, because the tint of cane molasses differs from that of the standard saccharan soln. This can be corrected by the addition of alkali to the molasses, but its effect on the color intensity is not const. for different molasses. Vermehren's method (*C. A.* 6, 1073) gives too high results, because not only caramel, but all other coloring matters, including those in the original juice are detd. by it. Upsher Smith's method (*C. A.* 5, 3609) also is unsuitable, because the tint of the standard soln. is different from that of

cane molasses, and because it is impossible to detect the color change of phenolphthalein in the latter. K. draws the conclusion that none of the methods proposed gives correct results. The last three give at best only an idea of the total coloring matter present. For purposes of comparison Ehrlich's method seems to be the best, because the standard used is a chem. compd. which can easily be reproduced. F. W. ZERRAN

The Java canes in Tucuman. ARTHUR H. ROSENFELD. *Intern. Sugar J.* 22, 681-3(1920).—Yields and analyses of varieties P. O. J. 36, 213 and 228, grown on the regular plantation scale are given. F. W. ZERRAN

Rapid method of ascertaining the amount of lime required for clarification. MANUEL L. ROXAS. *Sugar News* 1, No. 10, 13-4, 29; *Intern. Sugar J.* 22, 710(1920).—R. proposes to make the NaOH soln. used in titrating the juice of such strength that, if a certain number of cc. is taken for titration, the buret reading directly indicates the liters of milk of lime of a certain concn. to be added to each tank full of juice. F. W. ZERRAN

Laboratory notes (on limestones). VLAD. ŠKOLA. *Listy Cukrovar.* 38, 221-2 (1920); *Z. Zuckerind. Tschoslov. Rep.* 44, 383-4(1920).—The inferiority of several limestones for sugar house purposes is indicated by their analyses. JOHN M. KRNO

Chemical control of sugar beet fields (HAMOUS) 11D.

Recovering hydrochloric acid; glucose. H. TERRISSE, and M. LEVY. *Brit.* 154,170, May 7, 1290. HCl used in the manuf. of glucose as described in 143,212 (C. A. 14, 2870), is regenerated by subjecting the acid-satd. mash to distn. in one or more partially evacuated acid-proof receptacles, provided with scrapers to keep the contents from sticking to the heating members. A suitable construction is specified.

Modifying starch. E. H. HARVEY. U. S. 1,386,653, Jan. 25. An elec. current is passed through an elec. conducting bath (such as H₂O acidulated with HCl) containing starch to modify it so that it will dissolve in NaOH soln. to produce less viscous solns. and the action is stopped before the starch has passed the sol. stage. The product thus formed is adapted for use in the manuf. of vegetable glue.

29—LEATHER AND GLUE

ALLEN ROGERS

The chemist and his relation to the tannery. JOHN HELFRICH. *Color Trade J.* 8, 63-5(1921). E. H.

Early advances in leather chemistry. F. L. SEYMOUR-JONES. *J. Soc. Leather Trades Chem.* 4, 119-29(1920).—A short sketch of the development of the chemistry of leather manuf. is given, from the earliest recorded expts. to the year 1850. References are given to bibliographies. C. F. J.

The process of tanning. W. MOELLER. *Z. angew. Chem.* 33, I, 221-3(1920).—An answer to Gerngross (C. A. 14, 3819). M. outlines various theories that have been advanced regarding the process of tanning, and points out that it has been proved, after much exptl. work, that tanning is both a chem. and a phys. phenomenon. He claims that G. has disregarded all this and considered tanning as a purely chem. process. G.'s claims lay much stress upon the fact that there are basic reactive groups present in hide substance. M. asserts that it can never be proved that these groups remain in the part of the hide which forms leather. Protocatechualdehyde without soda does not tan, but behaves as picric acid, which is absorbed by hide powder. Knapp believed picric acid tanned, but it has been proved that it merely colors hide and can be washed out with cold water. G. has overlooked the fact that protocatechualdehyde belongs

to the class of substances, like pyrogallol, which contain autoxidizable groups. Upon the addition of soda the oxidizing power of the air and water is made available, and, as with pyrogallol and gallic acid, new combinations form in consequence of their colloidal character. This is not aldehyde-tanning in the common sense, but is similar to the phenomena appearing in quinone tanning. As G. has noted the color of the leather is similar to that of quinone-tanned leather. No tanning effect is obtained with *o*-vanillins and *o*-protocatechualdehydes. Resorcyraldehyde, an isomer of *o*-protocatechualdehyde, is insol. in water, and the alc. soln. is only faintly colored red (because of impurities). Animal hide is by no means colored or tanned by it. Immediately upon the addition of soda a tanning effect results. The soln. and the hide are deeply colored. This is similar to quinone tanning without the addition of soda. The tanning is not a result of the aldehyde groups, but the result of hydroxyl groups present in the ortho position. The aldehyde group is, however, accessible for tanning, and if it comes in contact with a split product or amino acid, a methylene amino acid is formed. M.'s study of hide structure (a paper soon to appear) shows that any theory of tanning which does not take the structure of the hide into account is weak. He defines leather as "animal hide of which the elementary parts in the form of submicroscopic intermingled crystal layers are protected from hydrolytic and fermenting influences." C. F. JAMESON

Chrome tanning. I. DONALD BURTON. *J. Soc. Leather Trades Chem.* 4, 205-18 (1920).—Violet Cr solns. tan more rapidly than green solns. of the same basicity figure, Cr, and neutral salt content. An explanation is offered based on higher acid (H-ion) concn. of the green soln., which leads to the conclusion that the properties of Cr leather are influenced not only by the percentage of Cr but also by the degree of basicity of the chrome salt on the fiber. The completion of tannage is shown to be best judged from the feel of a piece of leather after boiling. It may be possible to accelerate tanning in practice, as it is unnecessary to leave the pelt in the liquor till it stands the boiling test if the feel (absence of horniness and curling after boiling) be accepted as the criterion. Factors which det. tanning properties of a chrome liquor are: (I) Percentage of Cr, (II) acidity, or H-ion concn. (not basicity as now detd.). Properties of a liquor cannot be defined by strength and acidity without taking into account the astringency. The basicity figure is no criterion of H-ion concn., since liquors of the same chrome percentage, basicity figure and neutral salt content have widely different velocities of tanning. It also fails to take into account acids like H_2CO_3 and H_2SO_4 likely to be present in excess SO_2 chrome liquors. C. F. JAMESON

The nature of insolubles in tan extracts. ALEXANDER T. HOUGH. *Leather Trades Rev.* 11, 708-10(1920); cf. *C. A.* 15, 610.—Among the causes of unnatural insolubles in tanning exts. may be mentioned inefficient decantation, the use of stale and fermented blood for decolorizing, and for some exts. failure to remove the bark before extn. Autoclave extn. under pressure, owing to decompn. of tannin and cellulose, yields an inferior ext. especially when the liquors are run directly to the evaporators. It is believed that the clearer and brighter the ext. the better it is for tannery use, although some contend that insolubles make body and waterproof the leather. This may be so for those exts. which gradually deposit insolubles, for they penetrate the hide in the sol. form and sep. as insolubles in the fiber later, but those insolubles already existing can only clog the pores and cannot penetrate the hide, which acts as a perfect semi-permeable filter. The advantage in treatment by the tanner to clarify exts. high in insolubles is shown by a more complete utilization of the tannin, greater speed in tanning, and higher yields because of less scouring and little or no bleaching. The magnitude of the lost rough insolubles is often not realized because the quantities of insolubles thrown out of an ext. upon diln. to such strengths as are used in the tannery, usually bear no resemblance to the figures found from analytical strength. The work of Paess-

ler and Veit (*C. A.* 3, 1946) in detg. the insolubles at different concns. well illustrates the importance of this point. Figures from their work are given to show that the loss of tannin as insolubles may amt. to as much as 50% of the total tannin in the ext. With some exts. a slight gain in tannin may occur.

R. W. FEAR

The caprices of hide powder. E. SCHELL. *J. Soc. Leather Trades Chem.* 4, 155-7(1920).—In 1915 British leather chemists appointed a commission to control the manuf. and sale of an official hide powder. Official tests and labels were prescribed. Six lots of official hide powder have been made and offered for sale. It has been found impossible to maintain the desired uniformity in different lots. C. F. JAMESON

The question of the differences between different lots of official hide powder. E. SCHELL. *J. Soc. Leather Trades Chem.* 4, 157-9(1920).—At the Paris convention of Sept. 1919, S. first called attention to the erroneous results obtained by the official method of analysis when different lots of hide powder are used, particularly with lots B⁴ and B⁵. The British committee on this question has admitted a difference between these 2 lots when tested with chestnut ext. Practice has proved that by the official method the detn. of pptd. tannin is inaccurate, and that the detn. of non-tans is apt to be too low. It is urgent that the method receive more attentive study. The essential principle of all tannin analyses is the detn. of the total tannin as pure as possible by the pptn. of the gelatin salt. The impossibility of sepg. the tannin in an absolutely pure state causes inaccurate results. It is necessary that careful, systematic study of hide powder be made in order that the best conditions may be known for the detn. of pure tannin and that more accurate results may be obtained by the official method.

C. F. JAMESON

Leather. J. T. WOOD. *Brit.* 154,103, Feb. 4, 1920. In puering or bating goat and other skins by means of tryptic or other enzymes, the enzyme is applied as a paste to the grain side only in order to prevent loss of substance and, if necessary, delimited by means of an acid bath, previous to tanning. The activity of the paste may be regulated by diln. with an inert material such as kaolin or wood meal.

Synthetic tanning agents. CHEMISCHE FABRIKEN WORMS AKT.-GES. *Brit.* 154,162, Nov. 18, 1920. An aromatic hydroxy compd., or an alkali salt thereof, is condensed with an acid sulfite and HCHO or similarly acting substances in soln. at ordinary pressures and at temps. up to 100°. According to examples, com. phenol or carbolic liquor is condensed with HCHO and NaHSO₄, "cellulose extract" being also added in one case. The products are suitable for tanning agents, with or without addition of other tanning agents or a metallic salt.

Synthetic tanning agents. CHEMISCHE FABRIKEN WORMS AKT.-GES. *Brit.* 154,153, Nov. 17, 1920; cf. preceding pat. An aromatic hydroxy compd. or an alkali salt thereof, an aldehyde, and an acid sulfite are condensed together in soln. at ordinary pressures and at temps. up to 100°. The phenol used may be a mixt. and may be in the form of a soln. of its alkali salt as obtained technically. According to examples, commercial phenol or carbolic liquor is condensed with HCHO or AcH, and NaHSO₄. The products are suitable for tanning agents, with or without addition of other tanning agents or a metallic salt.

Dressing hides. E. KANET. U. S. 1,367,054, Feb. 1. Hides are tanned by immersing them in a soln. of ferric acetate and NaCl at a low temp. (preferably about 0-10°) and then heating in NaCl soln. for forming the basic oxides upon and between the hide fibers. This treatment produces a leather which is not hard nor over-tanned. Cr or Al salts may be similarly used.

Fish glue. E. KNUDSON. *Brit.* 153,526, Mar. 22, 1920. Before being cooked with H₂O to produce glue, fish remnants are bleached by immersion in a soln. prepd. by

adding Zn to H_2SO_4 , any acid remaining after rinsing being neutralized with lime water. In the case of fish remnants containing bones, these are treated prior to bleaching with a weak soln. of HCl, followed by neutralization with lime water. Cooking with H_2O may be carried out under reduced pressure or in vessels allowing free escape of water vapor.

30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

Contributions to the knowledge of rubber, especially regarding two dimethyl rubbers. H. POHLZ. *Kolloidchem. Beihefte* 13, 1-60(1920).—The paper deals mainly with the properties of two special rubbers. P. concludes that a coagulation structure does not materially affect the properties of a rubber, and that albumin compds. are not concerned in the development of soly. conditions as are the resins. A few expts. were devoted to dimethyl rubbers which contained liquid swelling media in place of resin. The elasticity was altered, and their resistance to oxidation from the air improved, but they developed blisters during vulcanization. By the terms insoluble swelling, soluble swelling, and soluble not swelling, three conditions of the rubber, the *a*, *b* and *c* modifications, may be defined.

ALAN LEIGHTON

A new process for the vulcanization of rubber. S. J. PEACHY AND A. SKIPSRY. *J. Soc. Chem. Ind.* 40, 5-6T(1921); cf. *C. A.* 14, 2873.—The Goodyear process has these disadvantages: (1) It requires continuous use of steam for heating, and application of pressure to prevent porosity; (2) it is comparatively slow; (3) it restricts the mfr. in the choice of filling and coloring materials, owing to the deleterious action of heat and steam on many org. substances. In the new process the rubber is exposed alternately to the action of SO_2 and H_2S . The gases diffuse into the rubber and produce active S which immediately combines with the rubber. There is some evidence that the product is superior to the Goodyear product in tensile properties, possibly because in the new process the depolymerization by heat is avoided. The SO_2 is added first, and then an excess of H_2S so as to avoid free acid in the product. Free S in the mixings is objectionable, owing to its tendency to convert the atomic or active S into the molecular form, which does not combine with rubber at ordinary temps.

J. B. T.

The Peachy vulcanization process. ANON. *India Rubber World* 63, 409-10 (1921).—A discussion of the Peachy process, in connection with the claim of Andre Dubosc that his article on "an hypothesis as to the process of vulcanization" (cf. *C. A.* 9, 1858) anticipated Peachy's invention, since he showed that SO_2 and H_2S united to form an active S which could combine directly with the rubber. (Cf. preceding abstract.)

J. B. T.

The American railway association, mechanical division master car builders and master mechanics specifications for standard airbrake and train air signal hose. ANON. *India Rubber World* 63, 427-8(1921).

J. B. T.

The aging of vulcanized rubber. O. DE VRIES AND H. J. HELLENDORF. *Arch. Rubbercul.* 4, 429-57(1920).—An investigation of the changes in tensile properties which occur on keeping, at ordinary (tropical) temp., for periods up to $2\frac{1}{2}$ years, rubber-S vulcanizates cured at 148° and containing 7.5% S shows that such changes are essentially similar to, although proceeding more slowly than, those observed in earlier "accelerated aging" expts. (*C. A.* 13, 1031, 1166). The stress-strain curve extends in a regular manner down the paper, i. e., $L_{1.30}$ diminishes regularly, the movement being at first quicker in the case of cures short of the standard than in the case of cures in the neighborhood of or beyond the standard, but being after about 6 mo. similar in rate for cures of different lengths. The tensile strength of cures short of the standard

(and also, apparently, of some standard cures) increases to a max. and then—slowly, in normal samples—falls. In general, the max. attained during aging is not as high as that produced by direct vulcanization. Cures short of the standard and corresponding, say, to a vulcanization coeff. of about 3, do not behave in any essential respect differently from cures in the neighborhood of the standard and corresponding to a vulcanization coeff. of about 5. Normal samples of plantation or *Hevea* rubber which have been given a standard cure (*i. e.*, the cure corresponding to $L_{1.30} = 990$) still show very good tensile strength after 1 year's and no marked deterioration even after 20 mos. keeping. Most of the samples were tested at 6 intervals during the aging period; and at each interval 5–8 rings were examd. The following shows the salient data for a typical crepe rubber for which the standard cure was: time, 127 min.; P_B , 1.39: (a) A 90-min cure (P_B , 0.915; $L_{1.30}$, 1158) showed its maximal tensile strength when tested after 663 days' aging (P_B , 1.27; $L_{1.30}$, 987) and had dropped when tested after 868 days' aging to P_B , 1.10 ($L_{1.30}$, 950). At the beginning of the aging period the movement of the curve was 0.625 *per diem* (3rd to 91st day), and at the end 0.195 *per diem* (746th to 868th day). (b) A 110-min. cure (P_B , 1.21; $L_{1.30}$, 1061) showed its maximal strength after 183 days (P_B , 1.375; $L_{1.30}$, 983) and showed after 646 days P_B 1.03; $L_{1.30}$ 895. At the beginning of the aging period (4th to 88th day) the movement of the curve was 0.485 *per diem*, and at the end (485th to 646th day) 0.20 *per diem*. A sample which had been prepd. after the Brazilian fashion but which had a higher rate of cure than fine Para behaved somewhat exceptionally, the movement of the curve being quicker than with ordinary plantation rubber (about 1–2 *per diem*). Two samples of rubber of poor quality prepd. from washings latex showed rapid deterioration on aging. The poorer of these samples (slope, 53.5; $P_{B \text{ max}}$, 0.93) deteriorated very rapidly. The results of de V. and H.'s tests differ from those of Stevens' aging tests with 10% S in Europe (*C. A.* 13, 387, 675) in showing (a) a quicker movement of the curve; (b) in no case an initial upward movement, but in all cases a regular downward movement of the curve; (c) in the case of rubber cured to a vulcanization coeff. of 4 or less, no increase of the tensile strength to a point above that obtained by direct vulcanization; (d) a very flat rather than a sharp max. in the tensile strength on aging normal samples, both in the case of vulcanizates with coeffs. of 3–4 and in the case of vulcanizates with coeffs. of 4–5. The authors also report expts. on the aging of a sample cured with 10, 7.5 and 5% S. The changes shown with 10% S were similar to those shown with 7.5%, but $P_{B \text{ max}}$ corresponded to a smaller $L_{1.30}$. With 5% S a similar, regular, downward movement of the curve was found to occur, not only with the standard cure and with an under-cure, but also with an over-cure in respect of which "reversion" (*cf. C. A.* 13, 916) had taken place. In the case, however, of cures in which all the S had combined, P_B fell rapidly after 6 mo. Vulcanizates containing free S remained dry on keeping and gradually moved towards brittleness, whereas vulcanizates in which all the S had combined became on aging weak, sticky and very inferior in appearance. [L = percentage length, P = stress in kg/mm², B = break, $P_{B \text{ max}}$ = maximal breaking stress.—ABSTR.]

G. S. WHITEBY

Influence of factors in rubber preparation on the aging qualities of vulcanized rubber. O. DE VRIES AND H. J. HELLEDOORN. *Arch. Rubbercult.* 4, 458–72 (1920). —In the light of the results obtained in the investigation of normal aging (*cf. preceding abstract*), the possible influence on the aging qualities of rubber-S vulcanizates with 7–10% S of a number of factors which may be involved in or of procedures which may be employed for the prepn. of raw rubber has been studied by comparison with control samples prepared in the usual manner with acetic acid. In general, the course of aging is found to be affected comparatively little or not at all by marked differences in the procedures followed in prepg. the raw rubber. The following are found to be without

appreciable influence on aging, *vis.*: excessive rolling of the wet coagulum (cf. C. A. 11, 2626); the use of 100% excess of acetic acid on coagulation (cf. C. A. 11, 2626); the use for coagulation of H_2SO_4 in the ordinary, small proportions; prepn. of the rubber by spontaneous coagulation after the addition of sugar to the latex (cf. C. A. 11, 2625); coagulation by NaCl. Maturation led to a somewhat quicker movement of the stress-strain curve at the beginning of the aging period (0.6–0.7 instead of 0.4–0.5 *per diem*), but otherwise the vulcanizates from matured rubber aged in the same way as the controls. Rubber prepd. by the evapn. of latex by hot air showed a somewhat more rapid movement of the curve and fell off more rapidly in tensile strength than its control. Rubber prepd. by partial coagulation of latex (cf. C. A. 12, 239) showed a normal downward movement of the curve but a somewhat rapid fall in tensile strength. Vulcanizates prepd. from the lower-grade rubbers showed normal aging changes in some cases, but in other cases rapid deterioration. *E. g.*, (a) a scrap rubber (standard cure: 120 mins., P_B 1.29) showed, on aging a 105-min. cure (P_B 1.09, $L_{1.20}$ 1033), normal changes in P_B , *vis.*, an increase to a max. of 1.36 after 331 days followed by a fall to 1.27 ($L_{1.20}$ 908) after 459 days. The downward movement of the curve was, however, somewhat rapid at first (0.7 *per diem* during the first 62 days); (b) a poor sample of washings crepe (slope, 45; standard cure: 100 mins., P_B 1.12) showed, on aging a 90-min. cure, an initial movement of the curve of 2.0 *per diem* and quickly deteriorated.

G. S. WHITBY

The aging of vulcanized rubber. O. DE VRIES AND H. J. HELLENDORF. *India Rubber J.* 61, 87–90(1921).—An abridged account of the two papers abstracted above.

G. S. W.

The necessity for tensile tests for the correct utilization of manufactured rubber. PEN HOARN. *Caoutchouc & gutta-percha* 18, 10683–9(1921).—A review of the work of Whitby, Eaton, C. O. Weber, Axelrod, Spence and others, showing the important facts regarding vulcanized rubber brought out by appropriate tensile tests.

J. B. T.

Some mechanical tests of rubber. WALTER A. SCOBLE. *Caoutchouc & gutta-percha* 18, 10695–8(1921).—The results of some tests on thread rubber are given. It is noted that the shape of the hysteresis curves depends to a considerable extent on the time required to reach the max. elongation employed, and the return to the original state of the test piece.

J. B. T.

Grain in rubber. H. SKELLON. *Rubber Age (London)* 1, 546–8(1921).—A description is given of the direction of the grain in rubber, as revealed by tearing, which is produced by the mixer, by the calender, by forcing machines and by various methods of vulcanization. Over-curing tends to accentuate grain, and so does the addition of factice.

G. S. WHITBY

Black stripe and moldy rot of *Hevea brasiliensis*. A. SHARPLES, W. N. C. BELGRAVE, F. DE LA M. NORRIS AND A. G. G. ELLIS. *Dept. Agr. Fed. Malay States, Bull.* No. 31, 59 pp. + plates.—Observations, investigations and a discussion of control measures with respect to two bark diseases. A serious epidemic of black stripe canker, probably due to a species of *Phytophthora*, appeared in Malaya in 1916, but the disease is not likely to be a permanent cause of loss to the plantations. Moldy rot, which affects recently tapped surfaces, is due to *Sphaeronema fimbriatum* (E. and H.) Sacc. This disease is at present localized but presents some rather alarming features.

G. S. W.

A Practical Guide to the Manufacture of Rubber Goods. London: MacLaren & Sons, Ltd. 496 pp. \$7.75.

Vulcanizing rubber articles. C. E. BRADLEY. U. S. 1,367,731, Feb. 8. Rubber

articles such as footwear are treated with steam or other heating medium applied directly to one side of the article and through a heat-conductor to the opposite side of the article while subjecting the interior of the article to a lesser pressure.

Vulcanizing rubber. GOODYEAR TIRE & RUBBER Co. Brit. 153,899, Sept. 7, 1920. An aryl substituted thiourea containing one or more alkyl groups, one of which is in *o*-position to the N of the thiourea, is used as an accelerator in the vulcanization of rubber. The accelerator is the product of the reaction of CS_2 on an *o*-alkyl substituted aromatic amine, *e. g.*, *o*-toluidine. In an example, a mixt. of 50 parts of rubber, 45.5 parts of ZnO , 3.5 parts of S, and 1 part of di-*o*-toluylthiourea is vulcanized by steam at a pressure of 40 lb. in 10 min.

Devulcanizing rubber. J. YOUNG and W. W. BENNER. Brit. 153,846, Aug. 6, 1919. See U. S. 1,324,093 (C. A. 14, 656).

Rubber compositions. P. SCHIDROWITZ, W. FELDENHEIMER and W. W. PROWMAN. Brit. 153,343, June 2, 1919. A rubber compn. contains china or other clay which has been treated with H_2O and a deflocculating agent, such as Na_2CO_3 or NH_4 , and which has been dried while in a deflocculated state. In an example, 180 parts of the treated and dried clay are mixed with 228 parts of rubber and 12 parts of S. Cf. 106,890 (C. A. 11, 2607) and 121,191 (C. A. 13, 647).

Rubber substitutes. P. BALKE and G. LEYSIEFFER. Brit. 154,157, Nov. 17, 1920. A rubber substitute is made by mixing a cellulose deriv. such as nitro- or acetyl-cellulose in a liquid state with or without a solvent, with a larger quantity of a gelatinizing medium such as trichloroethylacetanilide, ethylacetanilide, triphenyl phosphate, glyceryl acetate, dimethyl phthalate, etc., than is necessary for gelatinizing the cellulose deriv., adding larger quantities of org. or inorg. filling materials, heating to drive off H_2O , and molding under heat and pressure. In an example, 400 g. of nitro-cellulose are mixed for half an hr. with 260 g. of H_2O , and 1200 g. of barytes. 300 g. of a gelatinizing medium such as ethylacetanilide are added and the mass is kneaded for an hr., when the temp. is raised to evap. the H_2O . The mass is molded under pressure at a temp. of about 130° , and on cooling is ready for use.

